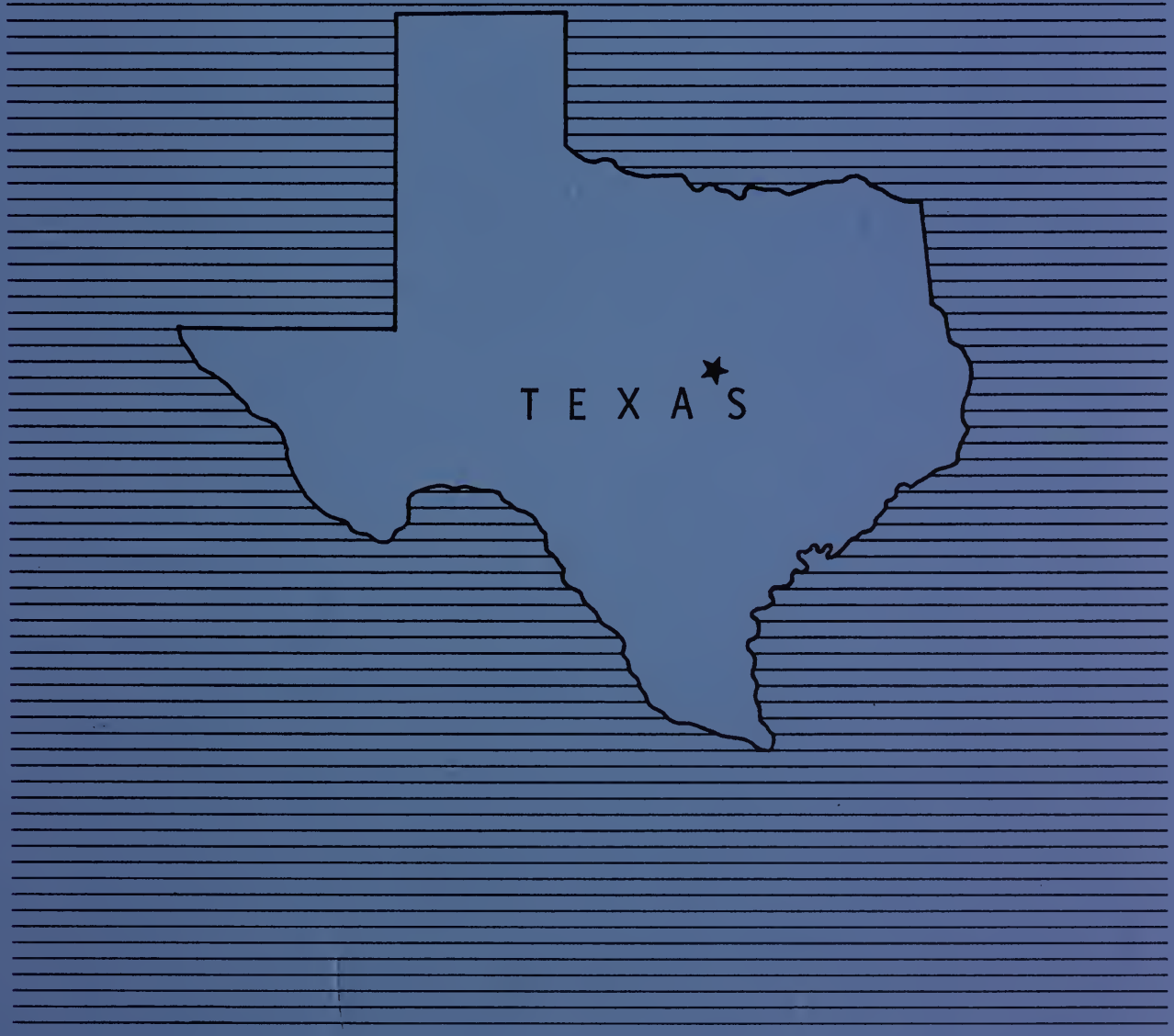
FINAL

ENVIRONMENTAL IMPACT STATEMENT

USDA-SCS-EIS-WS-(ADM)-75-1 (F) TX

ELM CREEK (CEN-TEX) WATERSHED PROJECT

BELL, FALLS, McLENNAN, and MILAM COUNTIES, TEXAS



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USDA-SCS-EIS-WS-(ADM)-75-1 - (F)-TX

Elm Creek Watershed (Cen-Tex)
Bell, Falls, McLennan, and Milam Counties, Texas

FINAL ENVIRONMENTAL IMPACT STATEMENT

Edward E. Thomas, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations:

Central Texas Soil and Water Conservation District
Route 1, Moody, Texas 76557

McLennan County Soil and Water Conservation District
Route 6, Box 126, Waco, Texas 76706

Bell County Commissioners Court
County Courthouse, Belton, Texas 76513

Falls County Commissioners Court
County Courthouse, Marlin, Texas 76661

McLennan County Commissioners Court
County Courthouse, Waco, Texas 76703

Milam County Commissioners Court
County Courthouse, Cameron, Texas 76520

Elm Creek Watershed Authority
Route 3, Box 114, Temple, Texas 76501

July 1975

PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Temple, Texas 76501

USDA FINAL ENVIRONMENTAL IMPACT STATEMENT

Elm Creek Watershed Project
Bell, Falls, McLennan, and Milam Counties
Texas

Prepared in Accordance with Sec. 102(2)(C) of P.L. 91-190

SUMMARY

I. Final

II. Soil Conservation Service

III. Administrative

IV. Description of Action:
This is a watershed project to be carried out by the sponsoring local organizations with assistance from the Soil Conservation Service, USDA, under the authority of Public Law 566, 83rd Congress, 68 Stat. 666, as amended, for the purposes of watershed protection and flood prevention. The project, located in parts of Bell, Falls, McLennan, and Milam Counties, Texas, proposes that land treatment be accomplished on about 24,600 acres of cropland, 33,500 acres of pastureland, and 5,400 acres of rangeland and that 45 floodwater retarding structures be installed during a 10-year installation period.

V. Summary of Environmental Impacts and Adverse Environmental Effects:

1. Reduce erosion on the uplands by 590,000 tons annually.
2. Maintain and improve the productivity and tilth of the soil.
3. Reduce area flooded by 58 percent.
4. Permit more intensive management of 1,650 acres of flood plain pastureland.
5. Reduce by 75 percent new channel formation damage by the valley trenching processes due to filling of existing streams.
6. Reduce the annual volume of sediment produced within the flood plain from 332,000 tons to 85,000 tons.
7. Reduce the sediment load carried out of the entire watershed from 425,000 tons to 124,000 tons annually.
8. Reduce flood plain crop and pasture damages by 66 percent.
9. Reduce other agricultural damages on the flood plain by 66 percent.
10. Reduce road and bridge damages on the flood plain by 85 percent.
11. Reduce overbank deposition damages on the flood plain by 72 percent.
12. Reduce flood plain scour damage by 75 percent.
13. Reduce streambank erosion damage by 75 percent.
14. Reduce valley trenching damage by 74 percent.

15. Reduce indirect damages by 68 percent.
16. Prolong low flows in downstream channels by continuous release of water from Sites 1 and 40.
17. Reduce possibility of water pollution from increased future use of agricultural chemicals and fertilizers by installing needed land treatment measures.
18. Create up to 1,776 acres of surface water for lake fisheries and waterfowl resting areas.
19. Reduce flood damages on about 26,600 acres of flood plain on the Little River downstream from the project.
20. Improve quality of wildlife habitat by installation of certain land treatment measures.
21. Improve the stream and farm pond fisheries habitat by reducing sedimentation.
22. Reduce flooding on 21,481 acres of flood plain wildlife habitat.
23. Result in greater agricultural efficiency and income stability for small farmers in the area and strengthen and expand the local economy by about $157,530 annually.
24. Create the need for approximately 22 new jobs as result of expansion of local economy.
25. Create approximately 154 man-years of employment during the installation of the structural measures.
26. Restrict the future land use on 6,534 acres of land needed to install and operate the structural measures.
27. Require land use be changed on 726 acres of cropland, 1,336 acres of rangeland, and 142 acres of stream channels needed for dams, emergency spillways, and sediment pools and change 1,621 acres of cropland to pastureland in the area needed for the detention pools.
28. Result in the occasional interruption of the use of the 4,217 acres of agricultural land and 113 acres of intermittent stream channels in the retarding pool areas subject to temporary inundation.
29. Require the temporary destruction of all vegetation on the 428 acres needed for dams and emergency spillways and the permanent destruction of vegetation on 1,776 acres needed for the sediment pools.
30. Result in displacement of the residents of one dwelling.
31. Result in the displacement of two farm enterprises.
32. Result in the displacement of the contents of 14 barns.
33. Result in an average annual net loss of $21,000 in agricultural production on the land needed for the structural measures.
34. Initially reduce the average discharge by about 4.4 percent at the mouth of the watershed.

VI. List of Alternatives Considered:

1. An accelerated program of applying land treatment measures for watershed protection.

2. Changing the present use of the watershed lands which suffer severe floodwater and erosion damage to a use that is less susceptible to damage.
3. An accelerated program of applying land treatment measures, floodwater retarding structures, and channel work.
4. Foregoing the implementation of a project.

VII. Agencies from Which Comments Have Been Received

U. S. Department of the Army
U. S. Department of Health, Education, and Welfare
U. S. Department of the Interior
U. S. Department of Transportation
Environmental Protection Agency
Advisory Council on Historic Preservation
Division of Planning Coordination (State agency designated by Governor and State Clearinghouse)
Central Texas Council of Governments (Regional Clearinghouse)

USDA SOIL CONSERVATION SERVICE

FINAL ENVIRONMENTAL IMPACT STATEMENT

for

ELM CREEK WATERSHED

Bell, Falls, McLennan and Milam Counties, Texas

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83rd Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Central Texas Soil and Water Conservation District
McLennan County Soil and Water Conservation District
Bell County Commissioners Court
Falls County Commissioners Court
McLennan County Commissioners Court
Milam County Commissioners Court
Elm Creek Watershed Authority

PROJECT OBJECTIVES AND PURPOSES

Reconnaissance studies were made by representatives of the Soil Conservation Service and sponsoring local organizations to determine watershed problems and possible solutions. Meetings were held with the sponsors to discuss their problems, possible solutions, watershed resource development needs, and the formulation of project objectives. The objectives selected were those that would contribute to the conservation, development, and productive use of the watershed's soil, water, and related resources.

The following specific objectives were agreed to:

1. Establishment and maintenance of necessary land treatment measures which will reduce soil loss to a rate that will permit a high level of productivity to be sustained economically and indefinitely.

2. Provision of a level of protection which will reduce floodwater, sediment, and erosion damages to a rate which will allow the productivity of the land to be sustained economically and indefinitely. The landowners stated that they plan to maintain the present land use in the flood plain. They also indicated that they plan to manage the pastureland at a higher level, primarily by establishing and properly managing improved varieties of grasses.

3. Preservation and improvement of the fish and wildlife resources.

4. Stimulation of the economic development of the area as a result of project installation.

The sponsors considered the impacts, both favorable and adverse, in developing the plan for meeting the project objectives. The objectives selected were those that would contribute to the conservation, development, and productive use of the watershed's soil, water, and related resources. The sponsors selected measures which would help to achieve those objectives and included measures to minimize adverse impacts where practicable.

PLANNED PROJECT

The project is an integrated one for environmental protection which includes soil, water, and related resource conservation measures, both vegetative and structural, needed to control erosion, maintain or improve soil fertility, reduce flooding, and stimulate the economy.

The watershed project is to be carried out by the sponsoring local organizations with assistance from the Soil Conservation Service, USDA, under the authority of Public Law 566, 83rd Congress, 68 Stat. 666, as amended, for the purposes of watershed protection and flood prevention. The project, located in portions of Bell, Falls, McLennan, and Milam Counties, Texas, proposes that 45 floodwater retarding structures be installed to reduce flood damages now occurring to 21,481 acres of flood plain and that land users be encouraged to complete the establishment and to maintain needed land treatment measures on 24,600 acres of cropland, 33,500 acres of pastureland, and 5,400 acres of rangeland at an accelerated rate during a 10-year installation period, in addition to maintaining those measures already applied.

Land Treatment

Conservation of soil, water, plant, and wildlife resources is the basic element of a flood prevention and watershed protection project. Treatment and use of land within the watershed largely determines the degree to which conservation objectives are attained. The function and useful life of structural measures such as dams and floodways are directly dependent upon the adequacy of conservation measures applied to the upstream land resource.

Planned land treatment will be accomplished by land users in cooperation with the Central Texas and the McLennan County Soil and Water Conservation Districts. The Soil Conservation Service will provide technical assistance to the soil and water conservation districts in the planning and application of soil, plant, and water conservation measures.

The land user will make the decision on the use of his land and the treatment measures which he will install on his lands.

Elm Creek Watershed, Texas

Land treatment measures which the sponsors plan to encourage the users of watershed lands to install are those that will reduce soil and water losses, assure proper functioning of the project structural measures, reduce flooding, and preserve and improve the fish and wildlife resources. The goal is to complete the application of needed treatment measures on 24,600 acres of cropland, 33,500 acres of pastureland, and 5,400 acres of rangeland during the 10-year installation period, in addition to maintaining those measures which have already been applied.

Land treatment measures expected to be installed on cropland include conservation cropping systems, crop residue management, diversions, terraces, contour farming, grassed waterways, and grade stabilization structures. Conservation cropping system consists of rotation systems which incorporate high residue crops and soil improving crops in the cropping pattern. The cropping pattern commonly used is 35 percent cotton, 50 percent grain sorghum, 10 percent small grain, and five percent hay and other crops. Crop residue management consists of leaving plant residues, including waste grain from grain crops, on or near the soil surface for protection against raindrop energy and the resultant erosion of the detached soil. The other cropland practices consist of water control measures designed to control erosion by disposing of runoff into stable outlets.

Land treatment measures which are expected to be applied on pastureland include pasture and hayland planting, pasture and hayland management, and critical area planting. Pasture and hayland planting consists of establishing adapted soil protecting forage plants on land formerly used as cropland for livestock grazing use. The plants most commonly chosen by the land users are coastal bermudagrass and common bermudagrass on about 90 percent of the land and kleingrass and lovegrass on the remaining 10 percent. Pasture and hayland management consists of management practices designed to maintain an effective soil protecting cover of vegetation on the land throughout all seasons of the year. Practices used to achieve this objective include fertilization, control of grazing, control of undesirable plants, etc. Critical area treatment consists of practices somewhat similar to pasture and hayland planting.

Land treatment measures expected to be applied on rangeland include proper grazing use and deferred grazing. These practices are designed to control grazing by livestock in order to maintain an effective soil protecting cover of vegetation on the land at all times and to maintain a variable plant community of the more desirable forage grasses and forb plants of the native prairie.

Measures which are expected to be applied to both pastureland and rangeland include ponds for livestock water supply and brush management to prevent woody plant takeover of lands used for grazing. Approximately 90 percent of the brush management consists of the eradication of invading mesquite and 10 percent consists of eradication of other invading low growth woody plants from land used for grazing. Land users are encouraged to apply this practice with consideration for needs of wildlife by leaving strips and mottes for cover and travel lanes.

Practices which are expected to be applied to all land uses for fish and wildlife resource conservation and development include wildlife upland habitat management and fishpond management. Wildlife upland habitat management includes the preservation of woody plant cover along watercourses and fence rows, special cover plantings, and seeding of food plants. Fishpond management consists of proper stocking after construction or renovation, proper fertilization, and harvesting of fish.

Structural Measures

A system of 45 floodwater retarding structures is planned for construction during the 10-year installation period. This system of structures will provide protection to the flood plain lands of the watershed. The location of the planned structural measures is shown on the project map (Appendix C). Figure 1 shows a section of a typical floodwater retarding structure.

Runoff from 47 percent of the watershed will be retarded by the structural measures.

The total capacity allocated for the anticipated 100-year accumulation of sediment is 13,812 acre-feet. The principal spillway crest of all the structures will be set at the capacity of the 100-year sediment volume predicted to be deposited as submerged sediment. The inlets for structures Nos. 1,4, 5, 6, 7, 12, 13, 19, 24, 25, 26, 27, 32, 34, 36, 37, 39, 40, 42, and 44 will be ported at the elevation which will limit initial impoundments to 200 acre-feet, including capacity of borrow. The sponsors have requested that the ports in the inlets of structures Nos. 1 and 40 be sized to limit the discharge of all sediment pool water impounded between 200 acre-feet and the principal spillway crest to approximately 1 cubic foot per second. The release of the sediment pool water at this rate will provide streamflow augmentation on Big Elm Creek and North Elm Creek. The principal spillways for all the structures will be the drop inlet type with cantilever outlets. Constriction plates will be used in 24 of the structures to limit the discharge capacity to less than the full pressurized pipe flow. All inlets will be ungated and will operate automatically. All of the structures will have provisions to release impounded floodwaters in order to perform maintenance, and if it becomes necessary, to avoid encroachment upon prior downstream water rights.

The total floodwater retarding capacity in the floodwater retarding structures is 48,040 acre-feet. This storage, combined with the principal spillway capacity for all structures, will provide protection to the emergency spillways. The emergency spillway of each structure will have a 4 percent or less chance of use at the end of 100 years after construction. The emergency spillways of all structures will be an excavated channel around the end of the embankments. All structures except structures Nos. 2, 3, 8, 9, and 10 will have emergency spillways excavated in earthen material. Structures Nos. 2, 3, 8, 9, and 10 will have emergency spillways excavated partially in a moderately hard, shaly limestone. All

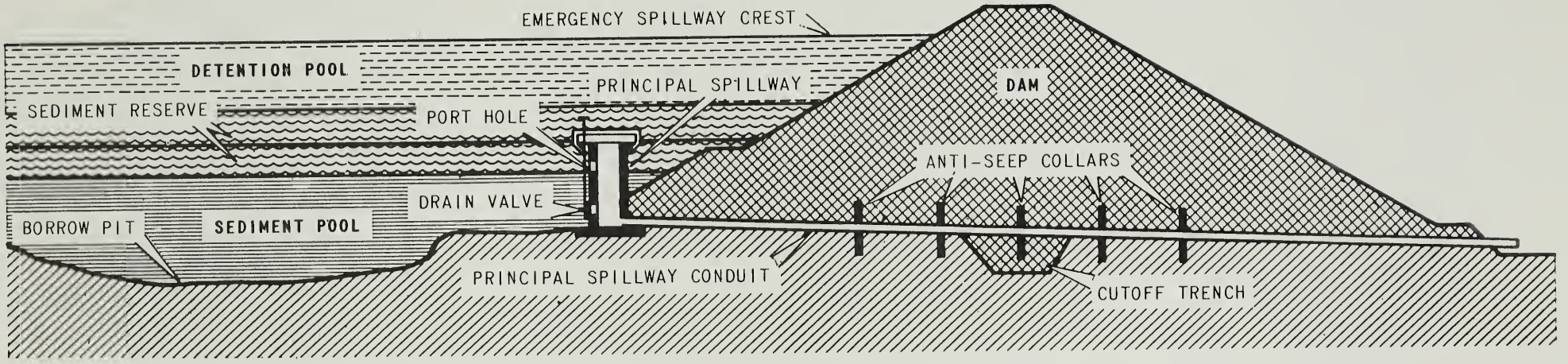

Figure 1

SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

emergency spillways, embankments, disturbed areas, and odd areas on or adjacent to the works of improvement will be vegetated to control erosion, provide wildlife food and cover, to minimize habitat loss resulting from construction, and to enhance the remaining habitat. Plant species will be selected, sited, and planted in accordance with SCS Technical Specifications for Establishment of Wildlife Habitat on or Adjacent to Watershed Works of Improvement.

The type of vegetation to be used will include annual and perennial vegetation of native and introduced grasses, forbs, shrubs, and trees. Sod-forming vegetation such as bermudagrass will be used as the base vegetation on embankments and spillways. Bunchgrasses, forbs, and shrubs such as bluestem species, kleingrass, maximilian sunflower, bushsunflower, dewberry, bush honeysuckle, buttonbush, and indigobush will be planted on disturbed areas, odd areas, and overseeded or planted at some locations. Wood species such as crabapple, autumnolive, russianolive, mulberry, walnut, oaks, and pecan will also be planted in odd areas within the rights-of-way. These plantings will be sited and planned in detail during the final design stage in consideration of specific site conditions. The selection of exact species to be used will be from the adapted species of seed and plant stock available at the time of construction. Fences will be constructed around the embankment and emergency spillway of each structure to protect the vegetation from damage by grazing.

Most of the floodwater retarding structures are located on yielding materials. Sites which have yielding materials of 10-foot thicknesses or greater include Sites 1, 4, 6, 7, 12, 32, 34, 36, 37, 38, 39, 40, 42, 44, and 45. Non-yielding bedrock strata occur on the remaining sites at depths of less than 10 feet and are overlain by firm foundation material.

Preliminary site investigations indicate that all needed borrow for the embankments should be obtainable from the emergency spillway areas and from within the sediment pool areas. The fill materials consist mainly of residual and alluvial silty clay (CL), clay (CH), and some clayey gravel (GC).

The environment will be protected from soil erosion and water and air pollution during construction. Contractors will be required to adhere to strict guidelines set forth in each construction contract to minimize soil erosion and water and air pollution during construction. Excavation and construction operations will be scheduled and controlled to prevent exposure of extraneous amounts of unprotected soil to erosion and the resulting translocation of sediment. Measures to control erosion will be uniquely specified at each work site and will include, as applicable, use of temporary vegetation or mulches, diversions, mechanical retardation of runoff, and traps. Harmful dust and other pollutants inherent to the construction process will be held to minimum practical limits. Haul roads and excavation areas and other work sites will be sprinkled

with water as needed to keep dust within tolerable limits. Contract specifications will require that fuel, lubricants, and chemicals be adequately labeled and stored safely in protected areas, and disposal at work sites will be by approved methods and procedures. All construction equipment will have safety and health features in compliance with the Safety and Health Act. Clearing and disposal of brush and vegetation will be carried out in accordance with applicable laws, ordinances, and regulations in respect to burning. Each contract will set forth specific stipulations to prevent uncontrolled grass or brush fires. Disposal of brush and vegetation will be by burying, hauling to approved offsite locations, or controlled burning, as applicable.

Necessary sanitary facilities, including garbage disposal facilities, will be located to prohibit such facilities being injuriously adjacent to live streams, wells, or springs in conformance with federal, state, and local water pollution control regulations. Conformance to all environmental control requirements will be monitored constantly by a construction inspector who will be on-site during all periods of construction operation.

Efforts will be made to avoid creating conditions which will increase populations of vectors which affect public health conditions. Prevention and control measures will be implemented, if needed, in cooperation with appropriate federal, state, and local health agencies to suppress proliferation of vectors such as aquatic insects, terrestrial arthropods and rodents, etc., that could occur with installation of the structure.

The environment will continue to be protected from erosion and water pollution following completion of construction. Project sponsors will operate and maintain the structural measures in accordance with a specific operation and maintenance agreement. The agreement will set forth the inspections to be made and the maintenance to be performed to prevent soil erosion and water pollution. The sponsors do not plan to provide public access to any structural measures and will discourage landowners from using any waters created by the project for incidental recreation until sanitary facilities meeting local and state health requirements are installed.

All applicable state water laws will be complied with in the design and construction of the structural measures, as well as those pertaining to the storage, maintenance of quality, and use of water.

As required by Public Law 86-523, the Service will keep the Secretary of the Interior informed of the construction schedule so that the Secretary can cause a survey to be made of the sites to ascertain whether such sites contain historical and archeological data which should be preserved in the public interest. Further, if any archeological materials are found during construction, the Secretary will be similarly notified.

The following is the planned sequence of installation of the works of improvement:

Elm Creek Watershed, Texas

Fiscal Year	Measures
1st	Land treatment
2nd	Land treatment and floodwater retarding structures Nos. 13, 14, 26, 30, 31, 41, and 43
3rd	Land treatment and floodwater retarding structures Nos. 3, 4, 5, and 42
4th	Land treatment and floodwater retarding structures Nos. 1, 2, 35, and 36
5th	Land treatment and floodwater retarding structures Nos. 8, 9, 10, 11, 19, 37, and 38
6th	Land treatment and floodwater retarding structures Nos. 15, 16, 20, 21, 39, 17, and 18
7th	Land treatment and floodwater retarding structures Nos. 6, 12, 22, 23, 24, and 25
8th	Land treatment and floodwater retarding structures Nos. 7, 27, 28, 29, 32, 33, and 34
9th	Land treatment and floodwater retarding structures Nos. 40, 44, and 45
10th	Land treatment

Land Use Changes

The minimum land rights required will be those necessary to construct, operate, maintain, and inspect the works of improvement; to provide for flowage of water in or upon or through the structures; and to provide for the permanent storage and temporary detention, either or both, of any sediment or water.

The following alterations, modifications, or replacements of existing improvements will be necessary in order to install the floodwater retarding structures:

Floodwater Retarding Structure No.	Item
1	Close county road, reroute powerline
2	Reroute telephone line
3	Alter powerline
5	Reroute county road
6	Alter powerline
7	Reroute county road, alter powerline
14	Alter pipeline
17	Raise county road
18	Raise county road, alter powerline
19	Raise county road

24	Close county road, relocate powerlines
27	Alter powerline
31	Raise county road
33	Reroute county road, alter powerline
39	Close county road, alter powerline
40	Raise county roads, alter telephone line
41	Raise county road
44	Reroute county roads, alter powerline, and telephone line

The Elm Creek Watershed Authority will be responsible for the required modifications of the above improvements. The modifications are minor in scope and will not result in any significant adverse environmental impacts.

Under present conditions the acquisition of land rights needed for installation of structural measures will result in the following displacements:

Floodwater Retarding Structure No.	Item
1	One dwelling with two persons, contents of of one barn
6	Contents of one barn
7	Contents of one barn
12	Contents of two barns
21	Contents of one barn
22	Contents of one barn
24	Contents of one barn
25	Contents of two barns
32	Contents of one barn
34	Contents of one barn
40	One owner-operated farm enterprise
44	One owner-operated farm enterprise and contents of one barn
45	Contents of one barn

No other displacements are apparent under present conditions. Necessary relocations or displacements will be carried out under the provisions of Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

The installation of the project will have insignificant effects on the mineral resources and related installations in the watershed.

Installation of the structural measures will require 6,534 acres of land. This area on which the dams will be constructed and on which sediment and floodwater will be impounded consists of 2,347 acres of cropland, 3,932 acres of pastureland and rangeland, and 255 acres (64 miles) of intermittent stream channels under present land use conditions. Construction of the dams

and emergency spillways will require 428 acres of land, which includes 200 acres of cropland and 228 acres of pastureland and rangeland. The sediment pools which will initially impound water will inundate 1,776 acres of land, which includes 526 acres of cropland, 1,108 acres of pastureland and rangeland, and 142 acres (37 miles) of intermittent stream channels. The retarding pools will temporarily inundate 4,330 acres of land, which includes 1,621 acres of cropland, 2,596 acres of pastureland and rangeland, and 113 acres (27 miles) of intermittent stream channels.

The sediment pools of all floodwater retarding structures are expected to hold water. The pools and surrounding areas have a good potential for incidental recreational use. The sponsors do not plan to assure public access to any of the structures; therefore, public recreational use will be prohibited at all sites. If at some future time public access is provided at any of the sites, the sponsors will assure that adequate sanitary facilities, in compliance with public health laws, are installed prior to making the area available for public use.

During construction operations, the areas needed for construction of the dams and emergency spillways and the borrow areas will be cleared of all existing vegetation. In addition, all large woody vegetation within the reservoir areas below the elevation of the lowest ungated outlet will be cleared. It is estimated that 560 acres of large woody vegetation will be cleared. The structure slopes, emergency spillways, disturbed areas, and idle areas around the structures will be vegetated with a mixture of adapted plant species for wildlife food, habitat improvement, and erosion control.

Operation and Maintenance

Land treatment measures will be maintained by the landowners and operators of farms and ranches on which the measures are installed under agreements with the Central Texas and McLennan County Soil and Water Conservation Districts. Representatives of the districts will encourage landowners to maintain land treatment measures.

The environment will continue to be protected from soil erosion and water pollution following completion of construction. Project sponsors will operate and maintain the structural measures in accordance with an operation and maintenance agreement for each floodwater retarding structure. The operation and maintenance agreement, in accordance with provisions of the Soil Conservation Service Texas Operations and Maintenance Handbook, will be executed prior to signing a project agreement for the construction of any of the proposed structural measures. A specific operation and maintenance plan will be prepared for each structural measure. The agreement will set forth the inspections to be made and the maintenance to be performed to prevent soil erosion and water pollution. The agreement will include specific provisions for retention and disposal of property acquired or improved with financial assistance from Public Law 566 funds.

Elm Creek Watershed, Texas

The Elm Creek Watershed Authority will be responsible for the operation and maintenance of all structural measures. Maintenance will be performed by the commissioners court of the county in which the structural measures are located. Funds for this purpose will be provided by the county and by a tax levied by the authority. Floodwater retarding structures Nos. 1 through 24 and 26 through 31 are located in Bell County, floodwater retarding structure No. 39 is located in Falls County, and floodwater retarding structures Nos. 25, 32 through 38, and 40 through 45 are located in Milam County. The estimated average annual cost of operation and maintenance is $12,100 based on current (1974) prices. The estimated average annual value of operation and maintenance is $7,700 for structural measures in Bell County, $4,000 for Milam County, and $400 for Falls County.

The Service and the sponsors will make a joint inspection annually or after unusually severe floods, or in the event of other unusual conditions that may adversely affect the works of improvement, for three years following installation of each structure. Inspection after the third year will be made annually by the sponsors. The Service will participate in annual inspections as often as it elects to do so after the third year. Inspection items are those items which may need maintenance. Items of inspection and maintenance will include, but will not be limited to, condition of principal spillways, earth fills, emergency spillways, vegetative cover, fences, gates, and vegetative growth in reservoirs. Also, the structures will be observed during operation and maintenance inspections for indications of pollution being created by direct livestock watering.

Immediately following completion of the structures by the contractor, the sponsors will be responsible for and promptly perform, or have performed, without cost to the Service, all maintenance of the structural measures as determined to be needed by either the sponsors or the Service. The sponsors will be responsible for maintenance of vegetation associated with structural measures after the initial vegetation work is adequately completed, as determined by the Service, but no later than three years following completion of each structural measure.
Maintenance of the floodwater retarding structures will consist of items such as controlling undesirable vegetation by mowing, hand cutting, or using herbicides; painting metal parts; and repairing eroded areas. The mowing operations for the most part will be done with a farm-type tractor or shredder. The method of application of herbicides will be in accordance with labeling, as required by the Federal Insecticide, Fungicide, and Rodenticide Act, as amended (86 Stat. 995).

An operation and maintenance agreement will be executed by the parties hereto prior to the signing of the initial project agreement and the issuance of invitations to bid on construction of the structural measures. The agreement will set forth specific details on procedure in line with recognized assignments of responsibility.

Project Costs

The estimated costs for installation of the project are presented in the following tabulation:

Installation Cost Item	Estimated Cost (Dollars) 1/		
	PL 566 Funds	Other Funds	
	Non-Federal Land SCS 2/	Non-Federal Land SCS 2/	Total
Land Treatment 3/			
Installation	-	1,284,799	1,284,799
Technical Assistance	214,910	218,140	433,050
Subtotal	214,910	1,502,939	1,717,849
Structural Measures			
Construction	3,183,700	-	3,183,700
Engineering Services	222,150	-	222,150
Relocation Payments	8,248	4,852	13,100
Project Administration	571,440	23,400	594,840
Land Rights (Including water rights)	-	939,691	939,691
Subtotal	3,985,538	967,943	4,953,481
TOTAL PROJECT	4,200,448	2,470,882	6,671,330

1/ Price Base: 1974
2/ Federal agency responsible for assisting in installation of works of improvement.
3/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just to adequately treated areas.

The ratio of the average annual benefits to the average annual cost is given in Appendix A.

The estimated average annual cost of operation and maintenance of the 45 floodwater retarding structures is $12,100.

ENVIRONMENTAL SETTING

Physical Resources

Elm Creek watershed project comprises an area of 207,360 acres, or 324 square miles, in the Brazos River Basin in Central Texas. It drains portions of southwestern McLennan, eastern Bell, western Falls, and northern Milam counties. 1/

The project area lies about 20 miles south of the metropolitan area of Waco and about 60 miles north of Austin. The city of Temple, population 33,431, lies on the western watershed divide. Moody, population 1,286, lies on the northern divide near the headwaters of Elm Creek and Cameron, population 5,546, lies on the southern divide near the confluence of Elm Creek with the Little River. The small towns of Rogers, population 1,030, and Buckholts, population about 100, lie on the southwestern watershed divide between Temple and Cameron. Troy, population 542, lies in the north central part and is the only town lying completely within the watershed. Numerous small community centers having populations of less than 50 occur throughout the generally well populated rural areas 2/.

The watershed is in the Texas-Gulf Water Resource Region 3/. Elm Creek flows into the Little River about 18 miles upstream from the confluence of the Little River with the Brazos River. There are no major reservoirs on the mainstem of the Little River or the Brazos River downstream from the project.

The watershed lies within the Black Prairie physiographic area. The topography varies from nearly flat on the wide flood plain in the lower reaches of Elm Creek to gently and moderately rolling in the uplands. Broad areas of gently rolling lands occur on the northern side of the mainstem of Elm Creek and most of the major tributaries. Moderately rolling to sometimes steep topography occurs along the south and southwestern sides of the mainstem and the major tributaries. Some steeply rolling areas also occur in the upper portion of the watershed where it is underlain by harder bedrock. Elevations above mean sea level range from 300 feet on the flood plain near the Little River to 850 feet on the northern watershed divide.

1/ All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigation by the Soil Conservation Service, U. S. Department of Agriculture.

2/ U. S. Department of Commerce, Bureau of Census, 1970 Census of Population, January 1974.

3/ U. S. Department of Agriculture, Soil Conservation Service, Atlas of River Basins of the United States, Washington, D. C., June 1971.

Elm Creek Watershed, Texas

The watershed is underlain by sedimentary rocks of the Upper Cretaceous and Eocene ages.4/ The Upper Cretaceous rocks occur under all of the watershed except the lower part. The Eocene rocks occur in the lower part near Cameron. A remnant of terrace gravel, possibly of Pliocene age, occurs along the southern watershed divide in the Rogers and Buckholts area and on other high divide areas in the lower part of the watershed. Pleistocene age terrace deposits and Recent age alluvial deposits occur in widths ranging from about 5,000 feet in the valley of Elm Creek to less than 200 feet on the smaller tributaries.

The bedrock is dominantly soft shale but includes some moderately hard shaly limestone of Upper Cretaceous age in the upper part of the watershed. The dip of the beds is to the southeast at a rate of slightly less than 100 feet per mile. The Balcones Fault System traverses the upper and central parts of the watershed. The trends of these faults are generally northeast to southwest, lying parallel with the outcrops of the southeasterly dipping rock units.

The watershed lies mainly within the Texas Blackland Prairie Land Resource Area.5/ Deep, dark colored, heavy clay soils of the Houston Black-Heiden-Austin association predominate. These soils are used extensively for cropland. Small areas of less intensively used shallow soil and soils of the Branyon-Stephen-Eddy association occur on the chalk bedrock in the upper portion of the watershed and mixed soils of the Wilson-Crockett-Burleson association occur on remnants of sandy terrace deposits in the lower portion.

The alluvial flood plain soils were derived mainly from the surrounding upland Blackland Prairie soils. These productive clay and silty clay soils are mainly of the Trinity and Frio series and are used extensively for growing cultivated crops.

The land use in the watershed is as follows:

Land Use	Acres	Percent
Cropland	122,267	59
Pastureland	62,263	30
Rangeland	13,065	6
Miscellaneous 1/	9,765	5
Total	207,360	100

1/ Roads, railroads, farmsteads, urban, and built-up areas.

4/ Bureau of Economic Geology, The University of Texas at Austin, Geologic Atlas of Texas, Waco Sheet, Austin, Texas, June 1970.

5/ Texas Agricultural Experiment Station, Texas A & M University, in cooperation with U. S. Department of Agriculture, Soil Conservation Service, General Soil Map of Texas, College Station, Texas, 1973.

Elm Creek Watershed, Texas

Land use of the flood plain is 36 percent cropland, 62 percent pasture-land, and 2 percent miscellaneous.

The average annual rainfall is about 34 inches. The rainfall is fairly well distributed throughout the year; however, the months of April and May normally receive the greatest amounts. The average temperatures for January and July are 48° and 85° F., respectively. The average date of the last killing frost in the spring is March 10, and that of the first killing frost in the fall is November 22, resulting in an average growing season of 257 days.[6/] The prevailing winds are southerly, ranging from the southeast to the south, southwest about 65 percent of the time. Velocities in excess of 12 miles per hour from southerly winds occur about 15 percent of the time

Mineral resources in the watershed are of minor importance. Oil was produced from a small oilfield in the lower portion of the watershed. Gravel is being produced from pits in terrace deposits near Cameron and from localized small pits in remnants of terrace deposits extending from Cameron to Buckholts. Some soft to moderately hard limestone is utilized from the Austin Chalk formation which extends northward from Temple through the Troy area. Limestone from this formation and clay from the underlying South Bosque Formation are mined for cement production 14 miles north of the watershed near Waco.

Ground water occurs throughout the project area. The Travis Peak Formation of the Trinity Group is the most important of several underlying aquifers.[8/] It occurs at depths of slightly less than 2,000 feet in the upper parts of the watershed to more than 3,000 feet in the lower part. The quality of the ground water is adequate for most uses in the upper portions of the watershed but becomes highly mineralized downdip (southeastward) in the lower portion of the watershed and is not generally suitable for domestic and household uses. Heavy usage of ground water by cities lying to the north of the watershed is causing a decline in the water table. Smaller quantities of ground water are also obtained from shallow, near surface sources and formations lying above the Travis Peak aquifer.

There are about 225 miles of streams having one square mile of drainage area or more within the watershed. In addition, there are many miles of intermittent channels which have less than one square mile of drainage area; however, these are not included in the following discussion of streams in the watershed. Elm Creek, the mainstem of the watershed, has a total length of about 50 miles. It heads near Moody in southwestern McLennan

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6/ U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, Climatological Data, Texas, Annual Summary, Vol. 75, No. 13, Asheville, N. C., March 19, 1971.

7/ Wind Rose - Waco, Texas, National Weather Service, Climatography of Texas 552-3-15.

8/ Hunter Engineers, Engineers-Consultants, Part 1: Basic Studies of a Comprehensive Plan for Water and Sewerage Systems, Bell County, Texas, Austin, Texas, 1968.

County and flows in a southeasterly direction across Bell County. It flows into the Little River near Cameron in Milam County. North Elm Creek, one of the larger tributaries, heads in western Falls County and flows into Elm Creek in the northern part of Milam County. Camp Creek and Cottonwood Branch lie within Bell County and flow into Elm Creek on the northeast side. Little Elm Creek heads north of Temple in Bell County and flows into Elm Creek on the southwest side. South Elm and Lipan Creeks head in Bell County and flow into Elm Creek in Milam County on the southwest side.

About 58 miles of the streams of the watershed have perennial flow or contain some permanent spring-fed water holes throughout the year during years of normal rainfall. Another 9 miles have permanent flow resulting from release of sewage effluent from the Temple treatment plant. The remaining 158 miles have flow ranging from less than 45 percent of the time to only short periods of time following runoff-producing rainfall.

Most of the streams are classified as natural, with man-made or altered channels limited to watercourses having less than one square mile drainage area.

Channel filling is presently causing major changes in the location and/or capacity of about 85 percent of the streams in the watershed. The capacities of the channels are being reduced and new channels are being formed in the flood plain (Appendix B). During recent years about 18 miles, or 8 percent, of the streams have been completely filled and new channels have been formed. Another 19 miles, or slightly over 8 percent of the streams, have lost more than one-half of their original capacities with much of the streamflow now being carried in newly developing channels. The streams in the upper portions of the watershed lying on or near the outcrops of the Austin Chalk bedrock have had little or no channel capacity loss due to sediment filling.

The concentration of total dissolved solids in runoff from the watershed is less than 500 parts per million. The prevalent chemical type is calcium carbonate and bicarbonate. Measurements made of runoff in an adjoining watershed showed a temperature range from 21° to 24° C. during the months of April through June.9/ Year-round temperatures probably range from as low as 2° C. in January to as high as 34° C. in July and August. The estimated average annual sediment load in the runoff from the watershed is 3,600 milligrams per liter. Normally, the concentration of sediment is highest in flood runoff occurring during the winter and spring when the cropland is bare during preparation for planting.

9/ U. S. Department of the Interior, Geological Survey, Water Resources Data for Texas, Part 2. Water Quality Records, 1969, page 474.

Elm Creek Watershed, Texas

Pre-project surface water quality was established by taking 18 samples through the watershed for analysis. The location of each sample is given in the following tabulation:

Sample No.	
1	From farm pond above county road in upper end of proposed FRS No. 1, near Bell and McLennan County lines
2	From Elm Creek at location of embankment of FRS No. 1
3	From Elm Creek at first county road below I-35 just east or northeast of Troy
4	From farm pond near road which will be in FRS No. 5
5	From Little Elm Creek at farm-to-market road near Oscar
6	From creek at farm-to-market road just below FRS No. 12
7	From Big Elm Creek at county road crossing just south of Seaton
8	From farm pond near county road just east of Oenaville in FRS site 17, adjacent to Gun Club
9	From Camp Creek at FM Road 437 south of Zabcikville
10	From Big Elm Creek at FM Road 437 near Red Ranger
11	From farm pond near road in FRS site No. 24 north of Meeks
12	From Elm Creek at FM Road 1915 west of Yarrellton
13	From farm pond near road in upper end of FRS No. 32
14	From South Elm Creek at FM Road 1915 north of Buckholts
15	From Elm Creek at FM Road 2269 north or northwest of Temple
16	From farm pond near road in FRS site No. 44
17	From North Elm Creek at FM Road 485
18	From Elm Creek at first county road just northeast of Cameron below US Hwy. 77

The results of the water analysis of each sample are given in the following water quality tabulation:

TABLE OF WATER QUALITY TESTS[1/]

Item	Sample No.																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Field Measurements Parameter																		
Temperature (°F.)	62	66	58	61	58	58	59	58	62	61	62	60	58	58	62	63.5	60	62
Dissolved Oxygen (ppm)	10.0	8.3	10.6	9.6	9.1	7.0	10.1	9.4	9.5	9.1	10.7	9.0	5.3	9.3	9.0	8.45	9.0	9.1
pH	7.95	7.8	8.1	8.0	8.0	7.8	8.05	8.1	7.9	8.0	7.6	8.05	7.65	7.9	8.3	7.07	8.05	8.0
Water Analyses Parameter																		
$T\text{-}PO_4$ (ppm)	.03	.00	.00	.12	.25	5.73	.03	.12	.21	.31	.25	.25	.21	.28	.37	.12	.37	.37
BOD_5 (ppm)	5.7	3.6	3.6	5.4	3.3	9.9	10.8	2.4	7.2	7.8	2.4	7.8	11.4	10.8	9.6	3.9	7.8	7.2
$N\text{-}NO_3$ (ppm)	1	2	3	1	3	4	2	4	3	5	4	5	3	3	4	3	5	5
TDS (ppm)	182	268	262	196	386	520	384	142	408	368	278	306	346	466	338	184	366	379
Chemical Analyses (Soluble Salts):																		
Ca (ppm)	X	X	X	X	X	X	X	X	X	X	X	47.5	X	79.2	X	X	69.9	82.5
Mg (ppm)	X	X	X	X	X	X	X	X	X	X	X	.9	X	2.3	X	X	1.9	2.0
NA (ppm)	X	X	X	X	X	X	X	X	X	X	X	9	X	51	X	X	36	32
K (ppm)	X	X	X	X	X	X	X	X	X	X	X	4.6	X	4.2	X	X	3.5	3.4
Cl (ppm)	X	X	X	X	X	X	X	X	X	X	X	13.8	X	31.8	X	X	18.5	27.6
SO_4 (ppm)	X	X	X	X	X	X	X	X	X	X	X	30	X	75	X	X	50	41
CO_3 (as CO_3) (ppm)	X	X	X	X	X	X	X	X	X	X	X	0.0	X	0.0	X	X	0.0	0.0
HCO_3 (as HCO_3) (ppm)	X	X	X	X	X	X	X	X	X	X	X	162.3	X	183.0	X	X	118.3	142.7
Sediment Analyses[2/] Parameter																		
Arsenic	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	<0.1
Pesticides (ppm)	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Bacteriological Parameter																		
Fecal Coliform/100 ml	100	13	112	100	60	30	60	20	250	230	12	350	74	260	490	<2	770	520
Fecal Streptococci	X	228	X	X	40	X	210	X	X	X	X	660	X	X	X	X	X	X

1/ Sampling and analysis by Eastern Laboratory Service Associates, York, Pennsylvania. Samples were taken November 11 and 12, 1974.
2/ Pesticides present in mud and soil reported as ppm in whole product basis as an indication of water quality.

Elm Creek Watershed, Texas

Present and Projected Population

The population of the four-county watershed area has shown a steady growth of approximately 13 percent each decade since 1860 except for the decade from 1930 to 1940 when the population dropped by 4 percent. Based on OBERS BEA economic area projections, the population is expected to increase by 10 percent each decade to the year 2020.[10/] This would result in an estimated population for the four-county watershed area of approximately 498,000 in the year 2020.

Economic Resources

The economy generated within the watershed is based almost entirely on agriculture and associated agribusiness. Agriculture and associated agribusiness is expected to be of prime importance to the economy for the foreseeable future due to the basic demand for food and fiber.

All of the agricultural land in the watershed is privately owned. There are approximately 1,550 farms, which average about 125 acres in size, located wholly or partially within the watershed. Agricultural land values range from $300 to $600 per acre depending upon soil capability and location. Urban land values range from a few thousand dollars for a city lot to many thousands of dollars for commercial property.

Almost half of the agricultural income of the watershed is derived from livestock and its associated products and the balance from crops. Principal crops grown and average yields per acre are: Cotton, 350 pounds of lint; grain sorghum, 3,500 pounds; oats, 30 bushels and 2 animal unit months of grazing; wheat, 20 bushels and 2 animal unit months of grazing; and forage sorghums, 2.5 tons of hay.

The latest statistics which are available show a labor force of 121,840, or 39 percent, from a total population of 309,364 for the four counties within which the watershed is located.[11/] Approximately 2.4 percent (2,970 workers) are unemployed. This is below the state and national rate of unemployment. Approximately 7 percent (7,955 workers) are employed in the agricultural sector. The nonagricultural sector employs 110,910 workers: 21,270 workers in the manufacturing sector, and 89,640 workers in the nonmanufacturing sector.

The cities and towns of Temple, Cameron, Moody, Troy, Rogers, and Buckholts are located, either wholly or partially, within the watershed. Smaller communities located in the watershed and of importance to local residents are Oenaville, Ratibor, Seaton, Oscar, Zabcikville, Cyclone, Red Ranger, Meeks, Leedale, Yarrelton, Pettibone, Marak, and Splawn.

10/ U. S. Water Resources Council, OBERS Projection; Regional Economic Activity in the U. S., Volume 2, BEA Economic Areas, Washington D. C. 1972.

11/ Texas Employment Commission, Work Force Estimates for Nonmetropolitan Counties in Texas for April 1973, Austin, Texas, July 1973.

Temple and Cameron provide processing and marketing facilities for agricultural products and also provide schools, churches, excellent medical facilties, and most of the goods and services needed by watershed residents. The smaller cities and communities usually provide processing and marketing facilities for certain agricultural products, schools, churches, and goods and services needed by watershed residents in the immediate vicinity.

Good highways link these cities and communities with other population and marketing centers in all directions. Approximately 120 miles of paved roads and over 300 miles of all-weather roads serve the watershed residents. Also two railroads traverse the watershed, providing additional transportation facilities.

Plant and Animal Resources

The watershed occurs in the Blackland Prairies vegetation region. According to Dr. Frank Gould,12/ in its pristine condition little bluestem (Andropogon scoparius) was the dominant grass. Other important grasses are big bluestem (Andropogon gerardi), yellow indiangrass (Sorghastrum nutans), switchgrass (Panicum virgatum), sideoats grama (Bouteloua curtipendula), hairy grama (Bouteloua hirsuta), tall dropseed (Sporobolus asper), silver bluestem (Andropogon saccharoides), and Texas wintergrass (Stipa leucotricha). Woody plants such as live oak (Quercus virginiana), pecan (Carya illinoensis), elm (Ulmus spp.), and sugar hackberry (Celtis laevigata) occurred in occasional mottes along well defined drainage ways and adjacent to significant streamways. Many forbs and legumes such as maximilian sunflower (Helianthus maximiliani), engelmanndaisy (Engelmannia pinnatifida), gayfeather (Liatris spp.), halfshrub sundrop (Oenothera serrulata), and prairieclover (Petalostemum spp.) added color to the region and variety to the diet of foraging animals and birds.

Around the turn of the century, most original plant ecosystems were destroyed by the conversion of these prairies to cropland. Intensive cotton production on the rolling uplands resulted in severe soil erosion. Fortunately, much of this land has since been converted to tame pasture grasses such as common and Coastal bermudagrass (Cynoden spp.), with this trend expected to continue into the future.

Very few remnants of climax ecotypes remain. Most of the 13,065 acres of rangeland contain less than 25 percent of its climax flora. Buffalograss (Buchloe dactyloides), threeawns (Aristida spp.), Texas wintergrass, silver bluestem, and small amounts of little bluestem, make up most of the currently existing range flora. Introduced tame pasture grasses such as common bermudagrass and Coastal bermudagrass currently occupy 62,263 acres of the watershed. Woody plants such as hackberry, elm spp., ash spp., oak spp., and bumelia (Bumelia spp.) occur as dominants on 14,000 acres.

12/ Gould, F. W., Texas Plants, A Checklist and Ecological Summary, Texas A & M University, TAES, College Station, Texas 1962.

Texas bluegrass (Poa arachnifera) is a threatened plantspecies as a result of close grazing and conversion of rangeland to cropland and pastureland.

The watershed lies almost totally within the Blackland Prairie Game Region. 13/ This area once supported an abundance of wildlife, including buffalo, antelope, deer, and turkey. Conversion of the native tall grass prairie to cropland drastically changed the habitat conditions for wildlife. Big game species no longer occur in this area. The present wildlife is limited to several species of small game, furbearers, and nongame animals.

The principal small game species of wildlife are mourning dove, bobwhite quail, and fox squirrel. The principal furbearers are raccoon, beaver, nutria, ring-tailed cat, skunk, opossum, red fox, gray fox, and mink. The principal nongame species include cottontail rabbit, swamp rabbit, jackrabbit, coyote, armadillo, herons, egrets, raptors, songbirds, and small reptiles and amphibians.

The watershed is located on the outer margin of a major flyway and thus receives only light use by migratory waterfowl.

The populations of wildlife species vary with the availability, interspersions, and quality of the habitat in the watershed. The overall habitat composition of the agricultural land for selected species of wildlife is on the following page.

There is very little habitat for waterfowl in the watershed. Resting areas for migrating waterfowl are provided by 800 ponds and the 67 miles of perennial flow in Elm Creek and its tributaries. Probably a few waterfowl spend the winter at these water areas.

No threatened or endangered species of wildlife are known to inhabit the watershed. However, the watershed is located within the migration route of the American peregrine falcon. The American peregrine falcon is listed as threatened nationally and endangered in Texas.

The Texas Parks and Wildlife Department indicated that the amount of hunting is light throughout the watershed. The principal game species hunted, listed in descending order of hunting days provided, are mourning dove, bobwhite quail, migratory waterfowl, and fox squirrel. It is estimated that the watershed provides an average of 2,800 man-days of hunting annually. Hunting is done by landowners and by invitation of the landowners.

13/ Texas Game, Fish, and Oyster Commission, Principal Game Birds and Mammals of Texas, June 1945.

WILDLIFE HABITAT QUALITY AND QUANTITY

Wildlife Species	Good Habitat		Fair Habitat		Poor Habitat		None		Total	
	(Acres)	(Percent)	(Acres)	(Percent)	(Acres)	(Percent)	(Acres)	(Percent)	(Acres)	(Percent)
Mourning Dove	158,000	80	40,000	20	-	-	-	-	198,000	100
Bobwhite Quail	32,000	16	24,000	12	142,000	72	-	-	198,000	100
Fox Squirrel	1,200	1	12,800	6	184,000	93	-	-	198,000	100
Raccoon	1,200	1	38,800	19	-	-	158,000	80	198,000	100
Cottontail Rabbit	16,000	8	48,000	24	134,000	68	-	-	198,000	100

The taking of furbearers is light in the watershed. It is estimated that an average of 3,200 man-days are spent in the hunting and taking of furbearers annually.

Two types of fisheries, pond and stream, exist in Elm Creek watershed. Out of approximately 225 miles of streams, only the lower 20 miles of Elm Creek contains the necessary deep pools to support a year-round fishery.

Approximately 800 ponds, totaling about 250 surface acres, provide good pond fisheries habitat. Ponds are normally stocked with black bass, hybrid sunfish and channel catfish.

Public access to fishing waters is limited to two fee catfish farms and nine public road crossings on the lower 20 miles of Elm Creek. The majority of fishing is done by landowners and their friends. Sport fishing is light. It is estimated that the watershed provides approximately 3,000 man-days of fishing annually. Commercial fishing is absent in the watershed.

Recreational Resources

Opportunities for outdoor and water-based recreation are limited to fishing along about 20 miles of spring-fed streams and in ponds, hunting of dove and quail, and other minor outdoor activities such as picnicking. Excellent facilities for water-based recreation and fishing are available nearby at Lake Belton, Stillhouse Hollow Reservoir, and floodwater retarding structures in nearby watersheds.

Archeological and Historical Values and Unique Scenic Resources

An archeological reconnaissance of the watershed conducted by the Archeology Research Program, Southern Methodist University, for the Soil Conservation Service, indicated that numerous archeological sites occur along the mainstem of Elm Creek from the mouth into the general vicinity of Troy and on the lower reaches of North Elm, Camp, Cottonwood, and Little Elm Creeks. The watershed lies between the Grand Prairie and the East Texas Deciduous Forest and may have served as a route for movement of people between these areas. This area has had very little archeological study and its importance is unknown.

There are no known historic sites within the watershed listed in, or in process of nomination to, the National Register of Historic Places according to the Texas State Historical Commission.

Soil, Water, and Plant Management Status

Most of the native tall grass prairie which originally covered the watershed was converted to cropland prior to the turn of the century.

The use of clean tillage methods, primarily for the production of cotton, allowed severe erosion to occur on steeply rolling lands and resulted in severe damage to large areas of these lands before the beginning of the conservation movement in the 1930's. The land is gradually being converted to pastureland by land users.

The Central Texas and the McLennan County Soil and Water Conservation Districts were organized in the early 1940's by interested landowners to encourage the application of needed conservation land treatment measures. Technical assistance is supplied to these districts by Soil Conservation Service personnel headquartered at Waco, Temple, Cameron, and Rosebud to aid land users of watershed lands in the development of soil and water conservation plans and the application of needed land treatment measures.

Soil and water conservation plans have been developed on 885 of the 1,550 operating units located wholly or partially within the watershed. Plans have been developed on 58 percent of the agricultural land in the watershed.

It is estimated that needed land treatment has been applied on about 40 percent of the agricultural land. The total cost of this application is estimated at $2,354,019.

Technical assistance to landowners for planning forestry measures such as tree plantings for recreational and aesthetic purposes and wood products is available from the Texas Forest Service within the going Cooperative Forest Management Program.

Projects of Other Agencies

There are no known existing or soon to be constructed water resource development projects within the watershed which have a direct relationship to the works of improvement included in the plan.

Several of the communities within the watershed have developed water supplies with financial assistance from the Farmers Home Administration.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

The broad concept of resource conservation has been accepted by many farmers and ranchers in the watershed as evidenced by their individual progress in applying conservation measures to their lands. From the average size of the farms in the watershed, it is apparent that some farms are marginal to submarginal as an economic unit. The rate of application of land treatment measures on these lands is often slow

because many of the landowners lack the necessary capital and management skills for applying needed measures.

Soil erosion and reduced organic content of the soil are primary problems on cropland. Soil erosion is most severe on land having slopes greater than one percent, or one foot fall per 100 feet length of slope. The productivity of many of the steeper soils in the watershed has been severely damaged by excessive erosion. Cotton farming in a clean-tilled monoculture did not produce the needed crop residues for protecting the soil against erosion and for supplying the organic matter needed for biological activity.

The trend has been to convert the severely eroded cropland to pastureland. However, the rate of conversion has slowed down in recent years. Approximately 17,000 acres of this marginal cropland is still in cultivation. About 40 percent of the land treatment measures on the land suited for future cropland use have not been applied.

The problems on pastureland and rangeland are poor cover and degraded plant composition. Most of the pastureland consists of eroded soils which are low in fertility and will not support the needed vegetation for erosion control or desired forage production. The natural thick cover of vegetation on the rangeland has been replaced by shorter, less productive and protective grasses and seasonal annual plants. More than 70 percent of the needed pastureland conservation measures and 60 percent of the rangeland conservation measures have not been installed.

Floodwater Damage

Damages to crops and pastures on flood plain lands are extensive throughout the watershed. Crops are often destroyed by floodwater, but a significant portion of the damages is related to delayed planting and harvesting with resultant increases in the cost of producing the crop and decreases in crop yields and quality of the product. These damages have forced operators to manage flood plain land well below the actual potential of the soils, resulting in reduced yields and incomes.

Floodwater damage occurs on about 22,900 acres of valuable agricultural flood plain land, excluding stream channels, along Elm Creek and its tributaries (Appendix B). This is the flood plain that would be inundated from a 100-year frequency event. At the present time, land use of the flood plain is about 12 percent cotton; 11 percent grain sorghum; 5 percent small grain; 8 percent forage sorghum; 12 percent improved pasture; 50 percent pasture; and 2 percent miscellaneous uses.

There are about 530 farm units that suffer floodwater damages. The average size farm unit is about 125 acres. There are no residences or businesses in the flood hazard area.

Other agricultural damages are extremely severe because of intensity of flood plain use. The conversion of areas of frequently damaged cropland to pastureland has resulted in a tremendous increase in livestock, fences, and other improvements being subject to damage by floodwater.

Private and public property, other than land, livestock and crops, subject to flood damage includes roads, bridges, fences, utilities, etc., and is valued at more than $2,000,000.

Most of the flooding results from high-intensity, short-duration thunderstorms that usually occur during the spring and summer. Flooding is also caused by rains of low intensity and long duration which occur during the fall and winter as a result of southward moving cold fronts and in late summer as a result of warm low pressure air masses moving inland from the Gulf of Mexico.

Minor flooding inundating less than half of the flood plain occurs at some locations on the average of three to four times a year. Major floods inundating more than half of the flood plain during recent years include those of 1957, 1959, 1965, and 1971.

The flood event of May 1965 was caused by a storm that produced rainfall of 6.3 inches at Temple, 6.8 inches at Troy, 3.9 inches at Burlington, and 3.7 inches at Cameron. In the vicinity of Temple, rainfall amounts of 8 to 9 inches were recorded by residents in the watershed. Rainfall amounts of 6.8 inches can be expected to occur about once each 10 years and 3.7 inches can be expected to occur about once each 2 years. Information obtained from residents of the watershed indicated that this storm inundated approximately 18,000 acres of the flood plain and produced damages in excess of $1,200,000 at current normalized prices.

The total average annual floodwater damages under without project conditions are estimated to be $452,870. Of this amount, $241,410 is crop and pasture; $185,130 is other agricultural; and $26,330 is road and bridge.

Indirect damages, such as interruption of travel, re-routing of school buses and mail routes, interruption of livestock feeding and care, losses to local business, and other similar losses, are estimated at $53,970 annually.

Erosion Damage

The present annual gross erosion rate in the uplands ranges from an average of about 2.5 tons per acre on pastureland to 9 tons per acre on cropland. The rates are highest on the poorly vegetated pastureland and untreated cropland, which average about 5 tons per acre and 15 tons per acre, respectively. These erosion rates exceed the rate which would allow sustained use of the soil resource for agricultural production and

create adverse problems downstream of streams filling with sediment and overbank deposition. The average annual permissible rate of soil loss ranges from 2 tons per acre to 5 tons per acre for the soils in the watershed. The average permissible rate of soil loss for the majority of soils being cultivated is 4 tons per acre annually.

Flood plain scour, valley trenching, and streambank erosion are a serious problem on the flood plain lands (Appendix B).

Flood plain scour is damaging an average of 3,188 acres of cropland annually. Sheet scouring removes productive topsoil from broad areas of cropland and channel scouring concentrates soil removal in narrow, continually deepening areas. Channel scouring ultimately results in abandonment of the land from further agricultural use. Damage in terms of reduced productivity of the flood plain soils ranges from 5 to 20 percent by sheet scouring and 20 to 40 percent for channel scouring. The average annual value of this damage is $38,520.

Approximately 400 acres of once productive flood plain land have been destroyed by the valley trenching process. About 18 miles of new stream channels have developed in recent years. Another 19 miles of new stream channel formation are in advanced stages of development. Valley trenching is presently destroying an average of 6.9 acres of flood plain annually through new channel formation in the deepened scour channels. The average annual value of this damage is $4,380.

Streambank erosion is voiding an average of 1.4 acres of flood plain land annually. This problem is most serious on the raw banks of the newly formed channels and is also occurring in some of the sharp bends of Elm Creek near the Little River. Streambank erosion in the upland areas is generally low with severe erosion limited to isolated areas. The average annual value of damage by streambank erosion is $880.

Sediment Damage

Large volumes of clayey sediment derived from the intensively cultivated uplands and poorly vegetated pastureland have been deposited on the flood plain and in the stream channels. Sediment accumulations to depths of more than 3 feet have damaged the productivity of 3,737 acres of agricultural land from 10 to 20 percent in terms of reduced productivity. These materials consist of poorly aggregated clays which seal and impede moisture and air movement in the soil and silt and fine sand which are lower in fertility than the original soil. The average annual value of this damage is $29,880.

Deposition of clayey sediment in streams has reduced the flow carrying capacity for streamflow in about 85 percent of all streams in the watershed. Total filling, accompanied with abandonment of the channel, has occurred on 18 miles or 8 percent of the streams. In addition, 19 miles

or slightly over 8 percent are in advanced stages of filling and abandonment. The filling of stream channels has increased the flooding problem and is one of the major causes of the valley trenching.

The amount of sediment carried out of the watershed is estimated to average 425,000 tons (238 acre-feet) annually. Eighty percent of this volume is derived from sheet erosion, 11 percent from flood plain scour, 5 percent from valley trenching, and 4 percent from streambank erosion. This volume of sediment results in an estimated average sediment concentration of 3,600 milligrams per liter, in the 86,600 acre-feet of average annual runoff at the mouth of the watershed.

Municipal and Industrial Water

Rural water supply corporations and small towns in the watershed obtain their water supply from ground water sources. The decline of the water table and the increasingly lower quality of the ground water downdip in the aquifer are problems in developing and increasing needed rural supplies from this source. The cities of Temple and Cameron obtain their water supply from surface sources which are adequate for their present and foreseeable future needs.

Recreation

The main problems relating to outdoor recreation is the lack of opportunity within the watershed. There are no parks or public lands where residents can picnic, fish, or hunt. The fish and wildlife resources are limited. High sediment loads and filling of streams which reduce fisheries habitat and quality of environment for fish also limit the desirability and use of the streams of the watershed for recreation. There is a definite need for additional recreational opportunities for watershed residents; however, the opportunities for development are limited.

Plant and Animal

The major problem associated with most species of wildlife, except mourning dove, is that the watershed does not have significant quantities of good quality habitat. The major limiting factors are the quantity and quality of woody habitat and food producing plants, the interspersion of land uses, and the distribution of watering spots. The land users are primarily concerned with the production of crops and grasses which produce the greatest economic return from the land. There is little or no economic incentive for providing for the needs of the various species of wildlife. Consequently, the only species of wildlife that flourishes is the mourning dove, which is well adapted to the present environment.

The most significant limiting factor for all forms of wildlife except mourning dove is the general lack of suitable woody habitat. Most of the

woody vegetation having the greatest potential for providing high quality habitat is located along the streams and on the flood plain. This habitat is presently being severely damaged by flooding, sediment deposition, erosion, and new channel formation.

The major problem associated with the existing stream fisheries is sediment filling of the streams and new channel formation. The major problem of the lake or pond fisheries is the high rate of sediment deposition in the ponds. The high concentrations of sediment in the runoff from the watershed reduce the quality of the aquatic environment in the ponds and streams.

Water Quality

The pre-project water quality samples indicated a higher phosphate content below Site 12 than at any other sample locations. This is probably due to sewage effluent from the Temple treatment plant. The City of Temple is nearing completion of a new treatment plant outside the watershed. This new facility will be in operation prior to the installation of this watershed project. Additional testing should be done after the new treatment plant is in use to determine any change in the phosphate level.

In addition, samples numbers 4, 5, and 7 through 18 indicate minor non-point pollution is occurring above the sample locations.

Economic and Social

About 1,400 operating units in the watershed are family-type farm operations employing less than 1-1/2 man-years of outside labor. About 450 of these units suffer damages from flooding. About 200 of these are low income producing units which require outside employment by their operators to maintain an adequate standard of living. The watershed economy is taxed approximately $580,500 annually in floodwater, sediment, and erosion damages alone. The small landowners can ill afford this added burden and continue a stable economic operation. There is a need for additional employment opportunities for the 2,970 unemployed in the four county watershed area. A concentrated effort in rural community development is needed to increase income and employment opportunities for local watershed residents.

Other

Other problems closely related to the agricultural flood damages include possible losses to local businesses; fears associated with possible future floods; and indirect losses such as the decline in property values, tax revenues, and community services.

ENVIRONMENTAL IMPACT

Conservation Land Treatment

The accomplishment of the sponsors' goal of the installation of needed land treatment measures on about 64,000 acres of land will reduce soil erosion by 590,000 tons yearly and maintain and improve the productivity and tilth of the soil. These measures will also reduce downstream floodwater and sedimentation damages by 6 percent, reduce the sediment load carried out of the watershed by 32 percent, reduce the peak rate of runoff from the uplands, and assure the proper functioning of the structural measures.

The trend of conversion of marginal cropland to grassland is expected to reduce the acreage of cropland by about 17,000 acres during the 10-year installation period. The projected future land use at the end of the installation period will be as follows:

Land Use	Acres	Percent
Cropland	105,000	51
Pastureland	79,000	38
Rangeland	13,000	6
Miscellaneous 1/	10,360	5
Total	207,360	100

1/ Roads, railroads, farmsteads, urban, built-up, etc.

Most of this change in land use is not project induced and is expected to occur even if the project is not installed. The only project induced land use change is that which will be required for the installation of floodwater retarding structures. The land use change will affect the needs, types, and amounts of the various measures that will be selected by the land users for installation on the land to reduce erosion and improve the soil resource while improving his economic return.

The application of additional land treatment measures will generally improve fish and wildlife resources in the watershed. The amount of improvement will vary from minor to significant, depending on the interests of the land users and the economic returns that can be anticipated.

The application of crop residue management will leave waste grain from grain sorghum and small grain crops on the surface of the soil for fall and winter food for dove and quail. Application of conservation cropping systems will improve food quality for dove and quail and improve the habitat for rabbit through the interspersion of crops. The installation of grassed waterways, pasture and hayland planting, and critical

area planting will improve the interspersion of plant cover on agricultural land and provide needed travel lanes for quail and rabbit. The portions of these treated areas which are planted exclusively to non-seed producing plants will limit food production for dove as well as quail. The application of pasture and hayland management will improve the habitat value of areas planted with seed producing plants, but will lower the habitat value of the non-seed producing areas where weed control is practiced. Where weed control is practiced, pastureland habitat could be improved by mowing weed in patterns which leave some weed producing plants undisturbed. Proper grazing use, planned grazing systems, and deferred grazing on rangeland will improve the tall grasses and improve the numerous forbs which are associated with this native plant community.

Brush management of woody plants, mainly invading mesquite on grazing lands, would have some detrimental effects to furbearers where total clearing is done but would improve interspersion of cover for quail, dove, and rabbit where it is applied in patterns. Construction of ponds for livestock watering will also provide needed watering spots for dove and raccoon and water surface for waterfowl resting areas. The application of wildlife upland habitat management by land users who are concerned about the needs of wildlife will directly improve habitat for all wildlife.

The reduction of erosion by all land treatment measures will improve the quality of the aquatic environment for fish species by reducing sedimentation in the 20 miles of streams and the 800 farm ponds. Application of fish pond management will improve the fishery resources of the watershed.

Structural Measures

The installation of the floodwater retarding structures will provide flood protection to 21,481 acres of the 22,900 acres of flood plain land.

Average annual flooding within the benefited area will be reduced from 17,149 acres to 7,155 acres, a reduction of 58 percent. Reduction in area inundated varies with respect to location within the watershed. The general locations and reduction in inundation are shown in the following tabulation:

Elm Creek Watershed, Texas

Evaluation Reach (Appendix B)	Total (acres)	Average Annual Area Inundated: Without Project (acres)	With Project (acres)	Reduction (percent)
1	795	712	205	71
1-A	1,360	1,301	160	88
2	290	297	37	88
3	2,020	1,817	1,005	45
4	363	78	56	28
4-A	661	656	327	50
5	2,790	1,648	524	68
6	53	28	0	100
7	2,490	950	286	70
7-A	195	45	3	93
8	1,106	856	324	62
9	3,700	4,100	2,060	50
10	2,535	2,561	1,280	50
11	3,123	2,100	888	58
TOTAL[1/]	21,481	17,149	7,155	58

1/ Excludes flood plain area in and above floodwater retarding structures which does not receive protection.

The installation of the planned structural measures will reduce flooding from a flood similar to that of May 1965 by approximately 5,700 acres on the benefited flood plain.

Although the planned structural measures will greatly reduce damages from flooding throughout the watershed, the threat of flooding remains. The level of protection provided to the flood plain of Elm Creek was considered adequate for the present agricultural use, but is not

considered adequate for the installation of improvements, such as buildings, which are subject to significant damage from flooding. The maximum protection will be provided to the flood plain immediately downstream of the planned structural measures. As watershed area controlled by structural measures decreases, a corresponding decrease in damage reduction will occur. The following tabulation shows the reduction of damages by reach:

Direct Monetary Floodwater Damage

Evaluation Reach (Appendix B)	Total Average Annual Damage: Without Project (dollars)	With Project (dollars)	Benefits (dollars)	Reduction (percent)
1	15,090	3,150	11,940	79
1-A	43,540	4,080	39,460	91
2	8,130	740	7,390	91
3	47,600	17,440	30,160	63
4	2,320	1,110	1,210	52
4-A	18,580	7,420	11,160	60
5	55,730	15,030	40,700	73
6	1,740	90	1,650	95
7	40,050	8,350	31,700	79
7-A	4,060	370	3,690	91
8	30,770	9,090	21,680	70
9	114,360	47,990	66,370	58
10	80,690	31,910	48,780	60
11	116,100	37,100	79,000	68
SUBTOTAL	578,760	183,870	394,890	68
X[1/]	1,740	1,650	90	5
TOTAL	580,500	185,520	394,980	68

1/ No structural control planned for reach X; reduction due to land treatment.

It is expected that about 1,650 acres of pastureland, now producing a minimum of palatable forage, will be managed more intensively. The reduction in flooding will allow operators to establish an improved variety of grass and manage the improved pastureland to a level commensurate with the soil's capability. This higher level of management will provide a greater degree of economic stability and allow the operator to utilize his land, time, labor, and machinery more efficiently. It is not expected that there will be a net increase of flood plain cropland, nor is it expected that the project will cause an increase in the acreage of crops in surplus supply.

Impoundment of water in the sediment pools will take 526 acres of cropland and 1,108 acres of pastureland and rangeland out of further agricultural production. Another 200 acres of cropland and 228 acres of pastureland and rangeland will be converted to use for dams and emergency spillways and will have restricted agricultural use as pastureland. It is expected that most of the 1,621 acres of cropland in the detention pools will be converted to pastureland. The total net loss of agricultural production resulting from inundation and construction of the structural measures is about $21,000. No measurable effect is anticipated on the management operations of the individuals affected.

The reduction of erosion in the uplands and flood plain and the resultant reduction in sediment load carried by streams of the watershed will effect similar reductions in stream filling and new channel formation by valley trenching. Valley trenching is not expected to be completely eliminated, however, and is expected to continue at a rate of about 27 percent of the present rate as the stream system continues to adjust to the effects of past damage by sedimentation.

The installation of all measures, both land treatment and structural, will benefit over 1,500 landowners and operators. About 530 farm units, of which about 450 are family-type operations, will have damages reduced as a result of the installation of structural measures.

The reduction in flooding and floodwater depths and velocities, sediment deposition, and erosion will reduce crop and pasture damages by 66 percent; other agricultural damages, 66 percent; road and bridge damages, 85 percent; overbank deposition damages, 72 percent; flood plain scour, 75 percent; streambank erosion, 75 percent; valley trenching, 74 percent; and indirect damages by 68 percent.

The planned floodwater retarding structures will modify the peak discharges of flood flows entering the Little River from the watershed. The estimated peak discharge from various frequency flood events are:

Frequency (years)	Without Project (cfs)	With Project (cfs)
100	31,100	18,200
25	21,700	12,700
5	12,400	7,300
2	7,500	4,400
1	4,400	2,800

Elm Creek Watershed, Texas

Initial filling of the sediment pools of the floodwater retarding structures up to the elevation of the lowest ungated outlet will require an estimated 6,671 acre-feet of water which will not be available as water yield from the watershed. This initial loss will be spread throughout the 10-year installation period and will average about 667 acre-feet per year. After complete installation of planned floodwater retarding structures, the average annual volume of streamflow from the watershed will be reduced about 4.4 percent as a result of evaporation and seepage losses from the sediment pools. However, as sediment accumulates in the sediment pools, the streamflow will again approach pre-project conditions.

The continuous release of water from the sediment pools of floodwater retarding structures Nos. 1 and 40 will prolong low flows in the downstream channels. This flow will create approximately 8 miles of additional permanent flowing streams for fisheries, waterfowl, and wildlife. These release flows are also expected to provide livestock water which will enable land users to better manage their pastureland by the distribution of grazing on the bottomland.

The quality of the runoff from the agricultural lands after the installation of the project is not expected to be affected appreciably except for the reduction in the sediment load being transported. There have not been any problems associated with water pollution from agricultural chemicals, fertilizers, or direct livestock watering use of the sediment pools in an adjoining watershed project which has similar soil and land use characteristics.

It is anticipated that pool areas of floodwater retarding structures will be used by landowners for direct livestock water which will enable operators to manage their pastureland to a higher degree by the distribution of grazing on the upland.

The direct watering of livestock should not have any significant adverse impact upon the quality of impounded water. Water quality samples Nos. 1, 4, 8, 11, and 16 reflect the existing quality of water impounded in farm ponds to which livestock have direct access. The quality of water does not appear to have been materially degraded by livestock. The relationship of livestock numbers per acre-foot of impoundment will be much less at the pools of floodwater retarding structures than at observed farm ponds, thus the effects of livestock on water quality should be far less.

The floodwater retarding structures will not detract from the rural pattern of intensive agricultural use of the watershed. The vegetated embankments and emergency spillways will blend in with the existing pattern of cultivated lands intermixed with permanent grassland. Water stored in the sediment pools will create attractive bodies of water in this setting.

Floodwater damages on about 26,600 acres of flood plain land on the mainstem of the Little River between the watershed and the Brazos River will be reduced as a result of project installation. This project will control an average of about 2 percent of the drainage area contributing floodwater to this area.

Elm Creek Watershed, Texas

The annual volume of sediment produced by flood plain scour, streambank erosion, and valley trenching will be reduced from an estimated 332,000 tons to 85,000 tons with the project installed. This reduction in flood plain erosion combined with the expected reduction of erosion in the uplands by land treatment and the trapping of sediment in the floodwater retarding structures will reduce the annual sediment load carried out of the watershed from 425,000 tons under without project conditions to 124,000 tons with project installed. This load represents a sediment concentration of 3,600 mg/l in the estimated average annual runoff of 86,600 acre-feet under without project conditions and 1,100 mg/l in the 82,800 acre-feet of annual runoff initially after installation of the project.

Installation of the 45 floodwater retarding structures will change 1,776 acres of small game habitat needed for sediment pools to a fisheries and waterfowl habitat. Construction of the dams and emergency spillways will temporarily destroy the small game habitat on another 428 acres. These areas will be revegetated with plants selected for erosion control and food and cover for wildlife. About 560 acres of this acreage is woody habitat for fox squirrel and furbearers and represents about 4 percent of this type habitat in the watershed. The remainder is open rangeland, pastureland, and cropland habitat for dove and quail, which represents about 1 percent of this type habitat in the watershed. Also included are about 38 miles (140 acres) of intermittent streams which may have seasonal use by waterfowl and six existing farm ponds.

The detention pools will temporarily inundate 4,330 acres of small game habitat composed of 1,621 acres of cropland, 10 acres of pastureland, 2,586 acres of rangeland, and 113 acres (27 miles) of intermittent stream channels. The periodic flooding of this habitat will be a temporary nuisance to wildlife. Expected conversion of the cropland to pastureland may reduce wildlife food availability if non-seed producing plants are used by the land user.

The sediment pools of the floodwater retarding structures will initially create 1,776 acres of surface water for waterfowl resting habitat and occasionally up to 4,330 acres of temporary waterfowl resting habitat during periods of impoundment in the detention pools. Approximately 25 of these pools, with a total surface area of 640 acres, will have good fisheries potential; 19 pools, with a surface area of 1,114 acres, will have fair fisheries potential; and one pool, with a surface area of 22 acres, will have a poor fisheries potential.

The reduction of sedimentation in the uplands by land treatment measures will improve the quality of the pond and sediment pool fisheries habitat. The reduction of the sediment load carried into streams of the watershed by both land treatment measures and the floodwater retarding structures will improve the 20 miles of existing stream fisheries and the 8 additional miles expected to be created by streamflow augmentation.

The project will reduce flooding on 21,481 acres of flood plain habitat, which includes about 1,200 acres of woody habitat in the form of narrow bands along the streams. Reduced flood plain erosion by scouring and valley trenching will improve this resource and reduce woody habitat

destruction associated with abandonment of existing tree-lined stream channels and formation of new channels in open land.

Installation of the project is not expected to have any effect on threatened or endangered species.

Access to watershed lands by the general public for fishing and hunting is not expected to change significantly with the project installed, as the sponsors do not intend to acquire any lands for recreational use.

An archeological survey was made of the areas which will be affected by the floodwater retarding structures. One archeological site was found to occur within the pool area of floodwater retarding structure No. 7. Study of this site by archeologists of the Archaeology Research Program, Southern Methodist University, showed that the site has been disturbed by farming activity and that salvage is not warranted. The Interagency Archeological Services-Denver, National Park Service, will be kept informed of the progress of the plan. If any archeological sites are located during the construction of the structural measures, a trained archeologist will be notified in order that these resources can be salvaged.

Economic and Social

The installation of structural measures will reduce substantially the direct income losses due to floodwater damage suffered by farm and ranch operators and associated agricultural businesses. This reduction in floodwater damage will result in greater agricultural efficiency and income stability for the small farmers of the area and strengthen the local agricultural economy. A strong local agricultural economy is essential in reducing the number of farmers and ranchers who are forced to the city in search of employment to maintain an adequate standard of living.

The reduction in sediment and erosion damages, the reduction in floodwater damages to crops and pastures, and the increased value of production due to the more intensive use of pastureland will result in new revenues in the local area. These revenues will result in a new expansion of the local economy by an additional $157,530 annually. This will also create a need for approximately 22 new jobs. In addition, the expenditure of funds for the construction of the works of improvement will create approximately 154 man-years of employment.

Under present conditions the acquisition of land rights needed for installation of structural measures will result in displacement of the residents of one dwelling, the owners and operators of two farm enterprises, and the contents of 14 barns. The displacements may well result in the upgrading of the economic and social well-being of the parties involved; however, no significant effect is anticipated on the watershed area.

FAVORABLE ENVIRONMENTAL EFFECTS

1. Reduce erosion on the uplands by 590,000 tons annually.
2. Maintain and improve the productivity and tilth of the soil.
3. Reduce area flooded by 58 percent.
4. Permit more intensive management of 1,650 acres of flood plain pastureland.
5. Reduce by 75 percent new channel formation damage by the valley trenching processes due to filling of existing streams.
6. Reduce the annual volume of sediment produced on the flood plain from 332,000 tons to 85,000 tons.
7. Reduce the sediment load carried out of the watershed from 425,000 tons to 124,000 tons annually.
8. Reduce flood plain crop and pasture damages by 66 percent.
9. Reduce other agricultural damages on the flood plain by 66 percent.
10. Reduce road and bridge damages on the flood plain by 85 percent.
11. Reduce overbank deposition damages on the flood plain by 72 percent.
12. Reduce flood plain scour damage by 75 percent.
13. Reduce streambank erosion damage by 75 percent.
14. Reduce valley trenching damage by 74 percent.
15. Reduce indirect damages by 68 percent.
16. Prolong low flows in downstream channels by continuous release of water from sites Nos. 1 and 40.
17. Reduce possibility of water pollution from increased future use of agricultural chemicals and fertilizers by installing needed land treatment measures.
18. Create up to 1,776 acres of surface water for lake fisheries and waterfowl resting areas.
19. Reduce flood damages on about 26,600 acres of flood plain on the Little River downstream from the project.

20. Improve quality of wildlife habitat by installation of certain land treatment measures.

21. Improve the stream and farm pond fisheries habitat by reducing sedimentation.

22. Reduce flooding on 21,481 acres of flood plain wildlife habitat.

23. Result in greater agricultural efficiency and income stability for small farmers in the area and strengthen and expand the local economy by about $157,530 annually.

24. Create the need for approximately 22 new jobs as result of expansion of local economy.

25. Create approximately 154 man-years of employment during the installation of the structural measures.

ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

1. Restrict the future land use on 6,534 acres of land needed to install and operate the structural measures.

2. Require land use be changed on 726 acres of cropland, 1,336 acres of rangeland, and 142 acres of stream channels needed for dams, emergency spillways, and sediment pools and change 1,621 acres of cropland to pastureland in the area needed for the detention pools.

3. Result in the occasional interruption of the use of the 4,217 acres of agricultural land and 113 acres of intermittent stream channels in the retarding pool areas subject to temporary inundation.

4. Require the temporary destruction of all vegetation on the 428 acres needed for dams and emergency spillways and the permanent destruction of vegetation on 1,776 acres needed for the sediment pools.

5. Result in displacement of the residents of one dwelling.

6. Result in displacement of two farm enterprises.

7. Result in displacement of 14 barns.

8. Result in an average annual net loss of $21,000 in agricultural production on the land needed for the structural measures.

9. Initially reduce the average discharge by about 4.4 percent at the mouth of the watershed.

ALTERNATIVES

The considered alternatives to the proposed action in planning for the development, conservation, and productive use of the soil, water, and related resources were: (1) an accelerated program of applying land treatment measures for watershed protection; (2) changing the present use of the watershed landswhich suffer severe floodwater and erosion damage to a use that is less susceptible to damage; (3) an accelerated program of applying land treatment measures, floodwater retarding structures, and channel work; (4) foregoing the implementation of a project.

A discussion of each alternative follows:

Alternative No. 1 - Alternative No. 1 consisted of applying the land treatment measures as proposed in the project action. Most of the impacts of the application of land treatment measures are discussed under "Effects of Works of Improvement." Average annual damages from floodwater, sediment, and erosion would be reduced by about 6 percent.

The favorable and adverse impacts that would be caused by installation of the structural measures would be foregone. The estimated cost of this alternative is $1,717,849.

Alternative No. 2 - Alternative No. 2 consisted of changing the present use of the watershed lands which suffer severe erosion and flood damage to a use less susceptible to damage.

The potential land uses in order from highest to lowest susceptibility to flood damage and erosion are urban and built-up, cropland, pastureland, and rangeland. Land used for other purposes, such as the transportation system and wildlife-recreation land, are damaged to varying degrees by flooding and erosion, depending upon the level of development.

This alternative would require changing the land use of the cropland located in the uplands that is being eroded at a rate which is destroying its productivity and the cropland located in the flood plain which is being severely damaged by flooding. The flood plain lands could be used for rangeland, pastureland, or wildlife-recreation land if extensive improvements were not installed. The uplands could be used for pastureland or wildlife-recreation land if proper cover were maintained..

This alternative would significantly reduce the actual monetary damage caused by floodwater, sediment, and erosion. It would significantly reduce the amount of sediment being carried out of the watershed. The damages to the transportation system would continue at about the

same rate. Damages to other agricultural property, livestock, etc., would increase as the land use changed. This alternative would reduce the annual net income on land changed from cropland to rangeland and pastureland by approximately $20 per acre. This alternative would cost about $5,250,000 to implement, and would create a whole new environment for the watershed. The number of businesses associated with a row-crop agriculture would be reduced. Many families that maintain an adequate level of income with a row-crop agriculture system would find it necessary to expand their farming operation to maintain the same level of income with the grassland.

The habitat for wildlife which depend upon a row-crop environment would be adversely impacted. However, the habitat for species of wildlife which depend on pastureland and rangeland would be improved.

Alternative No. 3 - Alternative No. 3 consisted of land treatment measures, floodwater retarding structures, and channel work.

The land treatment measures would be the same as in the proposed action. The location of the floodwater retarding structures would be the same as in the proposed action. However, only 22 floodwater retarding structures were considered. These were Nos. 1, 4, 5, 6, 7, 12, 13, 14, 15, 17, 18, 19, 21, 23, 26, 27, 32, 34, 39, 40, 42, and 44. These 22 structures would control runoff from 122 square miles, or 37.7 percent of the watershed. The channel work would consist of increasing the capacity of about 25 miles of the mainstem channel from where Little Elm Creek joins the mainstem to the point where the last county road crosses Elm Creek in the lower part of the watershed.

This alternative would cost an estimated $6,700,000 to install. This consists of $1,800,000 for land treatment, $3,400,000 for floodwater retarding structures, and $1,500,000 for the channel work.

The impacts of applying the land treatment measures would be the same as discussed under the environmental impacts of the proposed action.

Flood damages would be reduced by about 75 percent. This alternative would provide protection to 21,000 acres of flood plain. Installation of this system of structural measures would require the use of about 5,970 acres. The land would be used for the following purposes: Construction of dam and spillways, 300 acres; storage of sediment, 1,250 acres; temporary storage of floodwater, 3,520 acres; and 900 acres for channel work. The future use of this land would be restricted. A detailed study of the impacts of the channel work on the fish and wildlife resources was not made.

However, some adverse impacts could be expected to the fish and wildlife resources due to altering of the channel unless careful consideration was given to the resources during planning, design, and construction.

Alternative No. 4 - Alternative No. 4 consisted of foregoing the implementation of the project.

This would delay the application of land treatment measures, which would delay the impact these measures have on reducing sediment production from the watershed and would also delay the impact these measures have in reducing flood damage. However, it is reasonable to expect that the landowners and operators would eventually install the land treatment measures to maintain the productivity of their lands.

Flooding would continue, resulting in damage to the agricultural land and the transportation system.

The deterioration of the cultivated flood plain soils by scour would continue until the cumulative effect of this damage forced land use conversion to less productive uses.

Valley trenching and streambank erosion would continue to destroy an average of 8.3 acres of flood plain annually.

Areas subject to scour, valley trenching, and streambank erosion would continue to produce sediment.

The opportunity to store water for streamflow augmentation in two floodwater retarding structures would be foregone.

The need to use 6,534 acres of land to construct the structural measures and the resultant adverse impacts would be eliminated.

The creation of 1,776 acres of surface water which could be used for fish and wildlife would be foregone.

The opportunity to realize about $271,520 in average annual net benefits would be foregone.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The use of the land in the watershed is primarily for agricultural production. However, there is an increase in urban development and growth at Temple and along Interstate Highway 35, which crosses the upper portion of the watershed. Continued future growth is expected in this area because of the excellent transportation facilities provided by the highway and two

and one project appears feasible for planning. (Deer Creek). These four watersheds in conjunction with the Elm Creek watershed encompass a total drainage area of about 525,200 acres or 821 square miles. Including Elm Creek watershed, there are 97 floodwater retarding structures controlling runoff from about 281 square miles installed, approved, or planned for installation. It is not anticipated that floodwater retarding structures previously approved within the Knob Creek watershed will be installed. It is estimated that if Deer Creek watershed, which appears feasible, is installed, a total of about 110 floodwater retarding structures would be installed,which would control about 335 square miles, or 40 percent of the area in the contiguous watersheds.

The long-term habitability and contribution to the economic well-being of the area will be improved with only minimal detriment to a few features of the existing environment. In total, the natural environment and aesthetic values of the area will be benefited over those that would exist in the long-term without project measures.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Installation of the structural measures will require 6,534 acres of land. This area on which the dams will be constructed and on which sediment and floodwater will be impounded consists of 2,347 acres of cropland, 3,932 acres of pastureland and rangeland, and 255 acres (64 miles) of intermittent stream channels under present land use conditions. Construction of the dams and emergency spillways will require 428 acres of land, which includes 200 acres of cropland and 228 acres of pastureland and rangeland. The sediment pools which will initially impound water will inundate 1,776 acres of land, which includes 526 acres of cropland, 1,108 acres of pastureland and rangeland, and 142 acres (37 miles) of intermittent stream channels. The retarding pools will temporarily inundate 4,330 acres of land, which includes 1,621 acres of cropland, 2,596 acres of pastureland and rangeland, and 113 acres (27 miles) of intermittent stream channels.

Installation of the project will also require the commitment of labor, materials, and energy for construction and the operation, maintenance, and replacement of short-lived portions of the project.

No other commitment of resources is known to be required for this project.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

The application for assistance for the Elm Creek watershed was submitted to the Secretary of Agriculture through the Texas State Soil and Water Conservation Board (designated state agency). A field examination was made by the Soil Conservation Service and representatives of appropriate state agencies to determine that, within the requirements of national standards, there were no apparent obstacles to planning and carrying out a watershed project. The Texas State Soil and Water Conservation Board held a public hearing to solicit public reaction. The board then recommended that the Soil Conservation Service furnish planning assistance.

The work plan was developed in full consultation and cooperation with all interested agencies and individuals. Written notification of initiation of work plan development was sent to all federal, state, and local agencies that might have an interest in the project, soliciting information and comments. The Fish and Wildlife Service, U. S. Department of the Interior, in cooperation with the Texas Parks and Wildlife Department, made a reconnaissance survey of the fish and wildlife resources of the watershed. This report was used in plan formulation. The Corps of Engineers, U. S. Department of the Army, furnished survey information on the Little River, which was used in evaluating the effects this project would have downstream from the project boundaries. The Texas Water Rights Commission furnished assistance to the sponsors concerning compliance with state laws in the storage and use of water. A study of the watershed was made by representatives of the U. S. Forest Service and the Texas Forest Service to determine if there were any forest management possibilities. The State Historical Survey Committee determined if there were any known archeological or historical sites either listed in, or nominated to, the National Register of Historic Places that would be adversely affected by the installation of measures included in the project. Archeologists of the Archeology Research Program of Southern Methodist University conducted an archeological survey of the watershed through funding by the U. S. Department of Agriculture, Soil Conservation Service.

The sponsors contacted the communities within the watershed to determine if there was any interest in adding storage capacity for municipal and/or recreational uses in any of the floodwater retarding structures. The cities of Troy and Cameron expressed interest in developing a municipal water supply in conjunction with the project; however, after studying the possibilities, decided not to include additional storage capacity in any of the floodwater retarding structures.

Representatives of the sponsoring local organizations contacted land users for permission to survey and to explain how the program would affect their lands. Owners of pipelines, utility lines, etc., were contacted to determine what modifications, if any, would be necessary to their improvements when the project was installed.

The sponsors carried on an active public information program in an effort to keep the public informed as the project was formulated.

On November 22, 1974, prior to the preparation of the final plan, a public information meeting was held at Flag Hall, Cyclone, Texas. The proposed project and the environmental statement were discussed and the interested agencies and individuals were given the opportunity to present their views and recommendations, either orally or in writing. The plan and environmental impact statement were prepared considering the comments and recommendations offered by the agencies who reviewed the plan.

The following federal agencies were requested to review and submit comments and recommendations:

U. S. Department of the Army
U. S. Department of Commerce

U. S. Department of Health, Education, and Welfare
U. S. Department of the Interior
U. S. Department of Transportation
Environmental Protection Agency
Federal Power Commission
Advisory Council of Historic Preservation
Office of Equal Opportunity

The following state and local agencies were requested to review and submit comments and recommendations:

Division of Planning Coordination (State agency designated by Governor and State Clearinghouse)
Central Texas Council of Governments
Heart of Texas Council of Governments

Discussion and Disposition of Each Comment on Draft Environmental Impact Statement

All of the agencies requested to comment on the Draft Environmental Impact Statement submitted comments except the U. S. Department of Commerce, Federal Power Commission, Office of Equal Opportunity, and the Heart of Texas Council of Governments. The responding agencies' comments and the disposition of each are as follows:

U. S. Department of the Army

Comment: The Department stated that they foresee no conflict with any project or current proposal of their Department and that the draft environmental impact statement was considered to be satisfactory.

Response: Noted.

U. S. Department of Health, Education, and Welfare

Comment: The Department reviewed the draft environmental impact statement with no objections, but made the following comment concerning insect vectors: "The floodwater retardation aspects of the project will aid in the control of insect vectors having public health significance. However, the draft EIS does not speak of this as a consideration of impacts or of subsequent maintenance."

Response: A discussion relative to vector control has been added to the Final Environmental Impact statement in the "PLANNED PROJECT-Structural Measures" section.

U. S. Department of the Interior

Comment: The Department stated that the discussions pertaining to outdoor recreation and fish and wildlife resources were adequately presented.

Elm Creek Watershed, Texas

Response: Noted.

Comment: The Department stated that ". . . throughout the work plan, especially in the Environmental Quality Plan, there are issues included under the general topic of environmental objectives which should not be considered there. Some of the component needs for the environmental quality objective reflect economic development, regional development, and social well-being components which should appear in their respective alternative plans or evaluation accounts.

"An example would be using flood control as a component of the environmental quality objective. It should be recognized that fish and wildlife resources located within the flood plain, including the habitat upon which their survival is dependent, have adapted to the periodic flooding process. In fact, quite often the survival of these resources is vitally dependent upon this periodic flooding. Therefore, one cannot assume that the elimination of flooding will be a beneficial environmental impact. The natural flood plain ecosystem exists because of its periodic flooding. According to the Principles and Standards for Planning Water and Related Resources, Federal Register, Vol. 38, No. 174, page 33, '...the environmental objective reflects man's abiding concern with the quality of the natural physical-biological system in which all life is sustained.' Man-made dams and altered streamflow regimes are certainly not natural.

"Therefore, we recommend that the Environmental Quality Plan contain only those environmental components concerned with the quality of the 'natural environment' as stated in the above mentioned Principles and Standards. The only exceptions are features which serve other objectives but do not detract significantly from environmental quality."

Response: An introduction has been added to the three part addendum which sets forth the purpose of the addendum and also explains the formulation of the "Abbreviated Environmental Quality Plan." No change has been made in the "Abbreviated Environmental Quality Plan (Part III)." The plan was formulated in accordance with the Soil Conservation Service's interpretation of the Water Resource Council's guidelines, in which the environmental quality plan can and should provide national economic development, regional development, and social well-being effects that are incidental and do not detract from the environmental quality objective. The "Environmental Quality Account" of the selected plan as displayed in Part II of the addendum has been revised to delete measure of effects related to national economic development, regional development, and social well-being.

Comment: The Department stated that the proposed action will not adversely affect any existing or proposed unit of the National Park System

nor any site eligible for registration as a National Historic, Natural or Environmental Education Landmark.

Response: Noted.

Comment: The Department noted that reference to the Director, Southwest Region, as the National Park Service official to be kept informed of the plan should be revised to: Interagency Archeological Services-Denver, National Park Service, P. O. Box 25287, Denver, Colorado 80225.

Response: The referenced change has been made in both the watershed work plan and the environmental impact statement.

Comment: The Department stated that preliminary copies of the work plan and draft environmental statement were reviewed by their Denver Mines office in October 1974 and that the Soil Conservation Service made appropriate revisions regarding mineral resources and pipeline considerations in both reports.

Response: Noted.

Comment: The Department observed that tables in the work plan (page 37) and environmental statement (page 30) show that the project will reduce the average area inundated by 58 percent but that the actual reduction would be 43 percent when allowances were made for impoundment areas.

Response: We were unable to reproduce the calculations or rationale that evidently was used to arrive at a reduction of 43 percent as stated in the comment. The reduction of 58 percent, as shown, is correct for the area to be benefited. There is no relationship between average annual acres flooded and the area dedicated to the pools of the floodwater retarding structures. As indicated on both the project map and the problem location map, flood plain areas above floodwater retarding structures are quite small and flooding is infrequent. Average annual flooding is insignificant. It is a correct analysis that there are significant areas of impoundment behind the structures. However, the effects of the project on these areas are in no way related to average annual flooding or reductions in flooding. The adverse economic impacts of the project on these areas are accounted for through the recognition of loss in agricultural production. This loss of production is included as a project cost through the assessment of land rights costs, which on an amortized basis equal or exceed the net return from the production lost.

Comment: The Department observed that table listing reduction of floodwater damages (Work Plan, page 38; Statement, page 31) fail to take into account the $21,000 annual loss in agricultural production resulting from planned inundation. Although total reduction in monetary loss is listed as 68 percent, actual reduction is 64 percent when allowances were made for losses resulting from damming.

Response: See response to previous comment.

Comment: The Department observed that item 3, page A-3, appears to give an erroneous impression. They suggested showing 2,204 acres inundated, while 4,330 acres will have restricted use because of the threat of intermittent temporary inundation.

Response: The statement was changed to read: "Require 2,347 acres of cropland, 3,932 acres of grassland, and 255 acres of stream channel for project installation." Our use of the word "inundate" was incorrect inasmuch as the dam and spillway areas, which will not be inundated, is included in the total areas required.

Comment: The Department stated that the work plan is a good presentation of the proposed activities and explains them in adequate detail; that the statement covers the relevant environmental factors and gives a good basis for making decisions regarding the impacts of the project.

Response: Noted.

Comment: The Department stated that numbered items 6 and 7 in Part V of the environmental impact statement summary are individually correct but lead to some confusion when put together. They believe the wording should show clearly that No. 6 applies only to the flood plain, and that No. 7 applies to the watershed area.

Response: Numbered item 6 is changed to read: "Reduce the annual volume of sediment produced within the flood plain area from 332,000 tons to 85,000 tons." Item 7 is changed to read: "Reduce the sediment load carried out of the entire watershed from 425.000 tons to 124,000 tons annually."

Comment: The Department states that they believe a title would be helpful for the tables presented on page 20 of the statement and page 11 of the work plan.

Response: A title, "Wildlife Habitat Quality and Quantity," has been added to each table.

Comment: The Department states that paragraph 1, page 34, is a duplicate of paragraph 3, page 32 and does not need to be repeated.

Response: Paragraph 3, page 32, has been deleted.

U. S. Department of Transportation

Comment: The Department had no comments to offer nor any objection to the project.

Response: Noted.

Elm Creek Watershed, Texas

Environmental Protection Agency

Comment: The Agency classified the Draft Environmental Impact Statement as LO-1 and stated that they have no objection to the project as proposed and that the Statement and Work Plan provided sufficient information to adequately evaluate the environmental impact of the project.

Response: Noted.

Advisory Council on Historic Preservation

Comment: The Advisory Council has determined that the Draft Environmental Impact Statement and Work Plan appear adequate concerning compliance with Section 106 of the National Historic Preservation Act of 1966 and the provisions of Executive Order 11593, "Protecti and Enhancement of the Cultural Environment," May 13, 1971.

Response: Noted.

Comment: The Advisory Council noted in its review that should subsurface cultural remains be discovered during the construction phases of the project, arrangements will be made to salvage them. The Council reminded that if such remains are encountered, prior to initiating any action which would result in the destruction or substantial alteration of the property, the Service should seek a determination from the Secretary of the Interior respecting the property's eligibility for inclusion in the National Register of Historic Places. Further, should the Secretary of the Interior determine such properties are eligible for inclusion in the National Register, it is required to afford the Council an opportunity to comment in accordance with the "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800) which sets forth the steps for compliance with Section 106 and the Executive Order 11593.

Response: Noted.

Division of Planning Coordination (State agency designated by Governor and state clearing house)

The Division stated that the reviewing state agencies generally found that the draft Environmental Impact Statement complied with the intent of the National Environmental Policy Act. Several of the reviewing state agencies provided suggestions for clarifying and strengthening the subject documents. Copies of the letters of comments by these agencies were furnished for consideration. The comments from the reviewers and the responses made to the comments are as follows:

Elm Creek Watershed, Texas

Texas Water Development Board

Comment: The Board stated that they believed that the report should place an estimated acre-foot value on the reduction in runoff resulting from land treatment measures.

Response: The Soil Conservation Service does not believe that, under the present state of the art, estimates can be made of the effects of land treatment on runoff from a watershed with any reasonable degree of accuracy or validity.

Many studies addressed to the effects of land treatment on water yield have been undertaken. Results have varied widely and no acceptable method has evolved. One of the most comprehensive studies on a large watershed basin was a joint 5-year study conducted by the Bureau of Reclamation, Soil Conservation Service, and the Agricultural Research Service, the three Federal agencies most concerned with the conservation and wise use of soil and water resources. The following quotes are taken from the report[1/] issued by the study group:

"Data on many factors are extremely variable and only approximate. No data are available on some seemingly important factors.

"No statistical approach was found that would consistently assess effects of land treatment on streamflow from river basins, or even prove conclusively that such effects do or do not exist.

"Indeed, it is strongly suspected that the seemingly ideal statistical model - multiple regression - is not applicable to the hydrologic data now available.

"Much of the data regarding streamflow, watershed precipitation, rainfall intensities, land use, land treatment and related factors are fraught with uncertainties. These are so great that it is believed it cannot ever be demonstrated satisfactorily by statistical analyses, and with only the types and characteristics of watershed, streamflow, and climatic data now generally available, that conservation use and treatment of land affects water yield by streamflow.

"Overall, the many investigations carried out demonstrate that a procedure, based only on statistical significant results obtained from studies of river basins and research watersheds, could not be developed."

1/ Technical Bulletin No. 1352, U. S. Department of Agriculture, in cooperation with the U. S. Department of the Interior, Washington, D. C., March 1966.

Elm Creek Watershed, Texas

Comment: The Board stated that the 45 proposed floodwater retarding structures will put into permanent storage a certain amount of water that will no longer be available to other projects.

Response: Data relative to loss of water yield as a result of initial filling of sediment pools has been included in the work plan and environmental impact statement.

Comment: The Board stated that the temporary floodwater storage will alter to an extent, the flood-peak characteristics of the stream, which is important to designers of downstream reservoirs.

Response: Effects of project installation on peak discharges at the mouth of the watershed have been included in the work plan and environmental impact statement.

Texas Water Rights Commission

Comment: The Commission noted that the documents reflect implicitly that reasonable consideration was given to the Commission staff review comments on the draft versions of the documents. The Addendum to the work plan, summarizing the economic, social, and environmental assessment of the project, significantly enhances the project justification.

Response: Noted.

Comment: The Commission stated that clarification would be desirable as to the specific Federal statutory or regulatory authorization, basis and purpose for the Addendum Part III, entitled "Abbreviated Environmental Quality Plan," involving diverse construction projects and action totalling $21,327,800. Furthermore, clarification would be desirable as to whether the $21,327,800 project is presented as the cumulative Public Law 566 project or as an extension of the basic Public Law 566 project. The Commission staff has been unable to locate readily the statutory or regulatory authorization for the aforementioned Addendum Part III, work in the Water Resources Council Principles and Standards (38 FR 24778, September 10, 1973) or in other guidelines pertaining to Public Law 566 projects. Also, if there is a relationship between Part III of the Addendum, and the Draft Environmental Impact Statement, this should be made clear.

Response: A new introduction to the Addendum has been included in the final work plan to provide clarification.

Comment: The Commission stated that the design, operation and maintenance criteria of the structural measures reflect satisfactory consideration of water rights requirements.

Elm Creek Watershed, Texas

Response: Noted.

Comment: The Commission noted that the Draft Environmental Impact Statement appears to fulfill the administrative, coordination, and analytical requirements of Public Law 91-190, insofar as water rights and related impacts are concerned.

Response: Noted.

Texas Department of Agriculture

Comment: The Department stated that they see no unacceptable environmental impact resulting from this proposed project and are pleased that these communities are initiating action to retard the deterioration of agricultural lands.

Response: Noted.

Comment: The Department questioned the desirability of converting 17,000 acres from cropland into rangeland. They noted that this trend may be necessary for the near future, but may have to be reversed in the longer term when the need for food demands increased production.

Response: The past trend in the watershed area has been to convert marginal cropland to improved pastureland. Land use conversion is expected to continue with or without project action. Long-term land use trends are of course uncertain because of both short- and long-term changes in price-cost relationship.

Comment: The Department noted that the work plan on page 12, line 13, should read "2,800 man-days annually" not "2,800 days annually."

Response: The work plan was changed as suggested. Also the same change was made on page 19 of the Environmental Impact Statement.

Comment: The Department stated that there is an apparent inconsistency in the tables on pages 15 and 37. In both cases, reach 9 is shown as having a larger inundated area than the size of the reach.

Response: The total flood plain area in reach 9 is 3,700 acres. The average annual area inundated in reach 9 is 4,100 acres. This includes some areas of the flood plain that are flooded two or more times every year because of inadequate channel capacity in reach 9.

Comment: The Department noted that the economic analyses and the cost-benefit ratio are calculated on the basis of funds being

available from several sources, with the largest single amount coming from a 100-year loan with 5.875 percent interest rate. They observed that even if such long-term, low rate loans are available, the desirability of this length loan term is questioned.

Response: The watershed work plan contains no provisions for loans of 100-year duration. The reference to 100-years, included as a footnote on table 4 of the plan, merely indicates that the project was evaluated on the basis of a 100-year life of full effectiveness. Under such a premise, the costs of installing structural measures are prorated over a 100-year period with a charge of 5.875 percent interest assessed as an equitable opportunity cost for this use of public funds.

Texas State Soil and Water Conservation Board

Comment: The Board stated that the project has been extensively coordinated and these documents present the most appropriate measures to meet the local people's objectives, consistent with applicable federal laws, regulations, and guidelines. The Board urges that these documents be channeled toward Congressional approval as expeditiously as possible, so that the people of Elm Creek Watershed who have sought this flood control project for twenty years can soon obtain assistance.

Response: Noted.

The University of Texas at Austin Bureau of Economic Geology

Comment: The Bureau stated that they foresee no significant adverse environmental effects associated with the project.

Response: Noted.

Texas Water Quality Board

Comment: The Board noted that the project would not pose lasting environmental problems and that the environment will be protected from soil erosion and water and air pollution both during and after construction. Also, that agreements with local sponsors will set forth provisions for complying with state health regulations at reservoirs prior to any public recreational use.

Response: Noted.

Comment: The Board observed that the environmental statement would be greatly enhanced if it included a narrative description and pertinent information on the highly intensive soil conservation

work that has been carried on within this watershed area. Since this early soil conservation work played a very prominent role in the soil and water conservation movement in this country it would be appropriate for it to be brought out and discussed in this report.

Response: It is correct that the central Texas area, including the Elm Creek watershed, was a forerunner in the soil conservation movement both in the state and the nation. However, a historical discussion of the fact is not considered pertinent to the purpose of the environmental impact statement.

Texas Highway Department

Comment: The Texas Highway Department through two letters of comment, dated October 30, 1974, and May 8, 1975, stated that although it appeared that highways and farm-to-market roads in the vicinity of the project would be largely unaffected by the proposed watershed improvements, they would appreciate the opportunity of reviewing the proposals of the Soil Conservation Service in greater detail in subsequent studies of plan development. Specifically, they would like to examine the detail plans for Sites 6, 11, 21, 23, and 34.

Response: Detailed information relative to floodwater retarding structures Nos. 6, 11, 21, 23, and 34 will be provided to the Texas Highway Department at an early date, and well in advance of any scheduling of construction.

Comment: The Texas Highway Department in their letter of October 30, 1974, stated that they would like to examine details of the proposed channel modifications at each highway and farm-to-market road crossing.

Response: No channel modification is planned for the watershed.

Comment: The Texas Highway Department in their letter of October 30, 1974, stated that on the basis of the limited engineering data presently available, it appeared that the overall plan will be beneficial to the Department and that they looked forward to working with the Soil Conservation Service in the same spirit of cooperation which has existed on many previous projects.

Response: Noted.

Central Texas Council of Governments

Comment: The Council stated that they find the project consistent with the area-wide and long range planning program of the Central Texas Region. The Council also stated that they wish to express support

for the project, and that they believe the project will be most beneficial to the area which it will serve.

Response: Noted.

LIST OF APPENDIXES

Appendix A - Comparison of Benefits and Costs for Structural Measures
Appendix B - Problem Location Map
Appendix C - Project Map
Appendix D - Letters of Comment Received on the Draft Environmental Impact Statement

APPROVED BY Edward E. Thomas DATE Oct 1, 1975

Edward E. Thomas, State Conservationist

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Elm Creek Watershed, Texas

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS[1/]						Average Annual Cost[3/]	Benefit-Cost Ratio
	Damage Reduction	More Intensive Land Use	Incidental Livestock Water	Other[2/]	Secondary	Total		
45 Floodwater Retarding Structures	361,020	33,100	4,260	19,720	157,530	575,630	269,040	2.1:1.0
Project Administration	xxx	xxx	xxx	xxx	xxx	xxx	35,070	xxx
GRAND TOTAL	[4/] 361,020	33,100	4,260	19,720	157,530	575,630	304,110	1.9:1.0

1/ Price Base: Current normalized prices for agricultural damages and 1974 prices for nonagricultural damages.
2/ Benefits accruing to structural measures outside project area on Little River.
3/ Price Base: Installation - 1974 prices amortized for 100 years at 5.875 percent interest. Operation and maintenance - 1974 prices.
4/ In addition, it is estimated that planned land treatment measures will provide flood damage reduction benefits of $33,960 annually.

February 1975

Figure 3

PROBLEM LOCATION MAP
ELM CREEK WATERSHED

BELL, MILAM, FALLS, MCLENNAN COUNTIES
TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS

Compiled from uncontrolled mosaic
4-R-10787

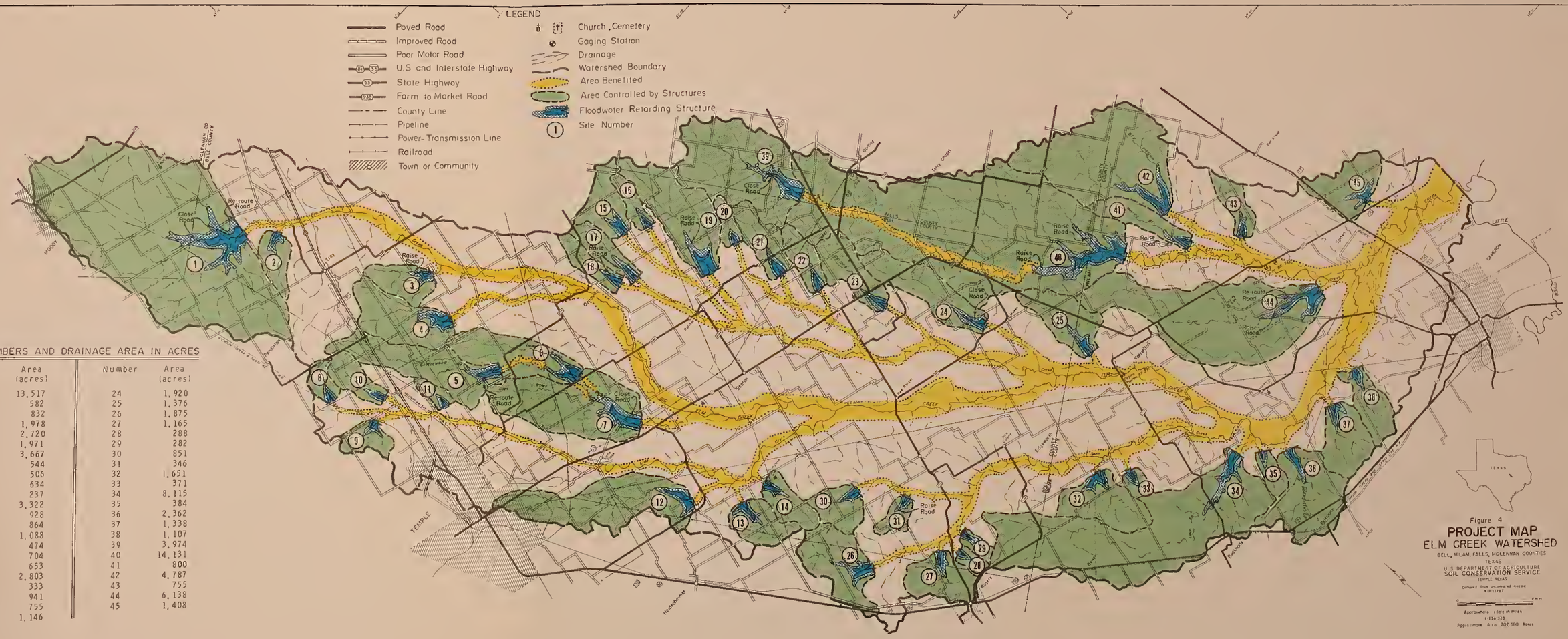
Approximate scale in miles
1/16/70

Approximate Area 207,360 Acres

PROJECTION UNKNOWN — LATITUDE AND LONGITUDE LINES ARE APPROX.

9-72 4-R-29943

Oct 27, 1969 Rev 1-71 4-R-13840



SITE NUMBERS AND DRAINAGE AREA IN ACRES

Number	Area (acres)	Number	Area (acres)
1	13,517	24	1,920
2	582	25	1,376
3	832	26	1,875
4	1,978	27	1,165
5	2,720	28	288
6	1,971	29	282
7	3,667	30	851
8	544	31	346
9	506	32	1,651
10	634	33	371
11	237	34	8,115
12	3,322	35	384
13	928	36	2,362
14	864	37	1,338
15	1,088	38	1,107
16	474	39	3,974
17	704	40	14,131
18	653	41	800
19	2,803	42	4,787
20	333	43	755
21	941	44	6,138
22	755	45	1,408
23	1,146		

Figure 4
PROJECT MAP
ELM CREEK WATERSHED
BELL, MILAM, FALLS, McLENNAN COUNTIES
TEXAS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS

Compiled from unpublished maps 4-9-1969

Approximate scale in miles 1:134,338

Approximate Area 207,360 Acres

9-72 4-R 29942
Oct 27 1969 Rev. 1-71 4-R 13840

APPENDIX D

Letters of Comment Received
on the
Draft Environmental Impact Statement

Deputy Administrator for
Water Resources

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83d Congress, the views of the Secretary of the Army were requested for the Watershed Work Plan and Draft Environmental Impact Statement for Elm Creek Watershed (Cen-Tex), Bell, Falls, McLennan, and Milam Counties, Texas.

We have reviewed the work plan and foresee no conflict with any projects or current proposals of this Department.

The draft environmental impact statement is considered to be satisfactory.

Sincerely,

Charles R. Ford

Charles R. Ford
Deputy Assistant Secretary of the Army
(Civil Works)

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGIONAL OFFICE
1114 COMMERCE STREET
DALLAS, TEXAS 75202

OFFICE OF
THE REGIONAL DIRECTOR

April 8, 1975

Our Reference: EI # 1275-519

Re: Elm Creek (Cen-Tex) Watershed

Mr. Edward E. Thomas
State Conservationist
Soil Conservation Service
Department of Agriculture
P. O. Box 648
Temple, Texas 76501

Dear Mr. Thomas:

Pursuant to your request, this office has completed a Departmental review of the Environmental Impact Statement in accordance with the provisions of Section 102(2)(C) of P. L. 91-190 and the Council on Environmental Quality Guidelines of April 23, 1973.

Environmental health program responsibilities and standards of the Department of Health, Education, and Welfare include those vested with the United States Public Health Service and the Facilities Engineering and Construction Agency. The U. S. Public Health Service has those programs of the Federal Food and Drug Administration (milk, food, interstate travel and shellfish sanitation) and of the Health Services and Mental Health Administration, which include the Bureau of Community Environmental Management (housing hygiene, injury control, recreational health, and insect and rodent control) and the National Institute of Occupational Safety and Health.

Attached are comments and reactions to the Environmental Statement made by departmental agencies concerned with environmental health aspects of the project.

We thank you for the opportunity to coordinate our mutual environmental interests as they relate to this project proposal.

Very truly yours,

William T. Crawford
Environmental Impact Coordinator

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

Reaction Review and Comments on Environmental Impact Statement for Project Proposal:

Draft Environmental Impact Statement Reviewed With Objections [ ]

Draft Environmental Impact Statement Reviewed With No Objections [X]

Date: April 3, 1975 EI# 1275-519

Agency/Bureau: DHEW/PHS Region VI

Project Proposal: Elm Creek (Cen-Tex) Watershed Project, Bell, Falls, McLennan and Milam Counties, Texas

Comments:

The Floodwater Retardation aspects of this project will aid in in the control of insect vectors having public health significance. However, the draft EIS does not speak to this as a consideration of impacts on of subsequent maintenance. We wnclose the publication Prevention and control of Vector Problems associated with Water Resources, and recommend its use as a guide in such matters in conjunction with state laws and regulations.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In reply refer to:
(ER-75/294)

MAY 27 1975

Dear Mr. Thomas:

Thank you for your letter of March 25, 1975, requesting our views and comments on the work plan and draft environmental impact statement for the Elm Creek Watershed (Cen-Tex), Bell, Falls, McLennan and Milan Counties, Texas. Comments on both documents are presented below.

WORK PLAN

We have reviewed the subject work plan and find the discussions pertaining to outdoor recreation and fish and wildlife resources adequately presented. However, throughout the work plan, especially in the Environmental Quality Plan, there are issues included under the general topic of environmental objectives which should not be considered there. Some of the component needs for the environmental quality objective reflect economic development, regional development, and social well-being components which should appear in their respective alternative plans or evaluation accounts.

An example would be using flood control as a component of the environmental quality objective. It should be recognized that fish and wildlife resources located within the flood plain, including the habitat upon which their survival is dependent, have adapted to the periodic flooding process. In fact, quite often the survival of these resources is vitally dependent upon this periodic flooding. Therefore, one cannot assume that the elimination of flooding will be a beneficial environmental impact. The natural flood plain ecosystem exists because of its periodic flooding. According to the "Principles and Standards for Planning Water and Related Land Resources," Federal Register, Vol. 38, No. 174, page 33, "....the environmental objective reflects man's abiding concern with the quality of the natural physical-biological system in which all life is sustained." Man-made dams and altered streamflow regimes are certainly not natural.

Therefore, we recommend that the Environmental Quality Plan contain only those environmental components concerned with the quality of the "natural environment" as stated in the above-mentioned Principles and Standards. The only exceptions are features which serve other objectives but do not detract significantly from environmental quality.

The proposed action will not adversely affect any existing or proposed unit of the National Park System nor any site eligible for registration as a National Historic, Natural or Environmental Education Landmark.

Reference to the Director, Southwest Region, as the National Park Service official to be kept informed of the plan should be revised to: Interagency Archeological Services-Denver, National Park Service, P. O. Box 25287, Denver, Colorado 80225. The Denver office noted above is now responsible for all interagency archeological services. (Work Plan, page 42, paragraph 1 and Environmental Statement, page 35, paragraph 4.)

Preliminary copies of the work plan and draft environmental statement for this watershed project were reviewed by our Denver Mines office, in October 1974 and the SCS made appropriate revisions regarding mineral resources and pipeline considerations in both reports.

We wish to point out some discrepancies in data presented in both documents. For example, tables provided in the work plan (page 37) and the draft statement (page 30) show that the project will reduce the average annual area inundated by 58 percent. However, because this is exclusive of flood plain areas that will be inundated behind the dams, it appears that flooding in one area is being traded off partly against that in another. Actual reduction is 43 percent when allowance is made for impoundment areas. Similarly, tables listing reduction of floodwater damages (Work Plan, page 38; statement, page 31) fails to take into account the $21,000 annual loss in agricultural production resulting from planned inundation (statement, page 37). Although total reduction in monetary loss is listed as 68 percent, actual reduction is 64 percent when allowance is made for losses resulting from damming.

Item 3, page A-3, appears to give an erroneous impression. We suggest showing 2,204 acres inundated, while 4,330 acres will have restricted use because of the threat of intermittent temporary inundation.

The work plan is a good presentation of the proposed activities and explains them in adequate detail. The statement covers the relevant environmental factors and gives a good basis for making decisions regarding the impacts of the project.

DRAFT ENVIRONMENTAL STATEMENT

Part V of the summary, numbered items 6 and 7, are individually correct but leads to some confusion when put together. We believe the wording should show clearly that No. 6 applies only to the flood plain, and that No. 7 applies to the watershed area.

We believe a title would be helpful for the tables presented on page 20 of the statement and page 11 of the work plan.

Paragraph 1, page 34, is a duplicate of paragraph 3, page 32, and does not need to be repeated.

We hope these comments and suggestions will be of assistance to you.

Sincerely yours,

Stanley D. Doremus

Deputy Assistant Secretary of the Interior

Mr. Edward E. Thomas
State Conservationist
Soil Conservation Service
P. O. Box 648
Temple, Texas 76501

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

MAY 20 1975

Mr. Edward E. Thomas
State Conservationist
Soil Conservation Service
P. O. Box 648
Temple, Texas 76501

Dear Mr. Thomas:

This is in response to your letter of 19 March 1975 addressed to Commandant, Coast Guard concerning a draft environmental impact statement for the Elm Creek (Cen-Tex) Watershed, Bell, Falls, McLennan and Milam Counties, Texas.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

W. E. Caldwell

W. E. CALDWELL
Captain, U.S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1600 PATTERSON
DALLAS, TEXAS 75201

May 16, 1975

Mr. Edward E. Thomas
State Conservationist
Soil Conservation Service
P. O. Box 648
Temple, Texas 76501

Dear Mr. Thomas:

We have reviewed the Draft Environmental Impact Statement and Watershed Work Plan, Elm Creek Watershed Project, Bell, Falls, McLennan and Milan Counties, Texas. The proposed project consists of land treatment measures to be accomplished on about 24,600 acres of cropland, 33,500 acres of pastureland, 5,400 acres of rangeland and the construction of 45 flood water retarding structures over a ten (10) year installation period.

We are classifying your Draft Environmental Impact Statement as LO-1. Specifically, we have no objection to the project as proposed. Also, the Statement and Work Plan provided sufficient information to adequately evaluate the environmental impact of the project. The classification and the date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal Actions, under Section 309 of the Clean Air Act. Definitions of the categories are provided on the attachment. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and on the adequacy of the impact statement at the draft stage, whenever possible.

We appreciate the opportunity to review the Draft Environmental Impact Statement. Please send us two (2) copies of the Final Environmental Impact Statement at the same time it is sent to the Council on Environmental Quality.

Sincerely yours,

George D. Putnicki
for Regional Administrator

Enclosure

ENVIRONMENTAL IMPACT OF THE ACTION

LO - Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER - Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to re-assess these aspects.

EU - Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

ADEQUACY OF THE IMPACT STATEMENT

Category 1 - Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 - Insufficient Information

EPA believes the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3 - Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement. If a draft statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

Advisory Council
On Historic Preservation
1522 K Street N.W. Suite 430
Washington D.C. 20005

APR 8 1975

Mr. Edward E. Thomas
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
P. O. Box 648
Temple, Texas 76501

Dear Mr. Thomas:

This is in response to your request of March 19, 1975 for comments on the Draft Environmental Statement (DES) and Watershed Work Plan (WWP) for the Elm Creek (Cen-Tex) Watershed, Texas. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council has determined that the DES and WWP appear adequate concerning compliance with Section 106 of the National Historic Preservation Act of 1966 and the provisions of Executive Order 11593 "Protection and Enhancement of the Cultural Environment" of May 13, 1971.

However, the Council notes in its review that should subsurface cultural remains be discovered during the construction phases of the project, arrangements will be made to salvage them. The Soil Conservation Service (SCS) is reminded that if such remains are encountered, prior to initiating any action which would result in the destruction or substantial alteration of the property, it should seek a determination from the Secretary of the Interior respecting the property's eligibility for inclusion in the National Register of Historic Places. Further, should the Secretary of the Interior determine such properties are eligible for inclusion in the National Register, it is required to afford the Council an opportunity to comment in accordance with the "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800) which sets forth the steps for compliance with Section 106 and the Executive Order 11593.

Should you have questions or require additional assistance in this matter, please contact Michael H. Bureman of the Council staff at (303) 234-4946.

Sincerely yours,

John D. McDermott
Director, Office of Review
and Compliance

ISCOE
NOR

OFFICE OF THE GOVERNOR
DIVISION OF PLANNING COORDINATION

JAMES M. ROSE
DIRECTOR

May 21, 1975

Mr. Edward E. Thomas
State Conservationist
Soil Conservation Service
U. S. Department of Agriculture
P. O. Box 648
Temple, Texas 76501

Dear Mr. Thomas:

The Preliminary Draft Environmental Impact Statement (PDES) and the Draft Work Plan for Watershed Protection and Flood Protection (WWP) for the Elm Creek Watershed (CEN-TEX) have been reviewed by the Governor's Division of Planning Coordination and by interested State agencies as required by the National Environmental Policy Act of 1969 (NEPA).

The review participants generally agreed that the PDES adequately conformed with the requirements of NEPA and the Texas State Soil and Water Conservation Board urged that the documents be submitted for Congressional approval as expeditiously as possible. However, several commenting agencies provided the following suggestions for clarifying and strengthening the subject documents:

1. The Texas Water Development Board stated that the document could be strengthened by including an estimate of the acre-foot reduction in runoff resulting from land treatment measures and the alteration of flood-peak characteristics of the stream resulting from the permanent water storage of the 45 proposed floodwater retarding structures.

2. The Texas Water Quality Board stated that the environmental statement would be enhanced by including a narrative description and pertinent information on the highly intensive soil conservation work that has been carried on within the watershed area.

3. The Texas Water Rights Commission (TWRC) noted that the addendum to the WWP significantly enhances the project justification; however, TWRC suggested that the document include the statutory or regulatory authorization for its preparation and an explanation of its relationship to the DES.

P. O. BOX 12428, CAPITOL STATION, AUSTIN, TEXAS 78711
Phone 512/475-2427 Offices Located in Sam Houston State Office Building

4. The Texas Department of Agriculture (TDA) stated that they are pleased that the communities involved are initiating action to retard the deterioration of agricultural lands but questioned the desirability of converting 17,000 acres from croplands to rangeland. The TDA noted the possible short term need for this action but suggested that long term demands for increased food production may require the reversal of this trend. The TDA also made several suggestions concerning the cost-benefit ratio and noted editorial corrections for your use.

5. The Texas Highway Department (THD) restated the need to examine in detail the plans for structures at sites in close proximity to existing highways and farm to market roads. In addition, the THD expressed an interest in examining the details of the proposed channel modifications at each highway and farm-to-market road crossing indicated on Figure 3 of the WWP.

The enclosed comments of the review participants are provided to assist in your planning effort.

Upon completion of the Draft Environmental Statement, this Division will assist you in coordinating the project among interested State agencies. If we can be of assistance during the development of this draft document, please let us know.

Sincerely,

Wayne N Beam for

JAMES M. ROSE
Director

JMR/jgs
Enclosures
cc: Mr. Harry P. Burleigh, Texas Water Development Board
Mr. Joe D. Carter, Texas Water Rights Commission
Honorable John C. White, Department of Agriculture
Mr. Harvey D. Davis, Texas State Soil and Water Conservation Board
Dr. C. G. Groat, Bureau of Economic Geology
Mr. Hugh C. Yantis, Jr., Texas Water Quality Board
Mr. B. L. DeBerry, Texas Highway Department

TEXAS WATER DEVELOPMENT BOARD

HARRY P. BURLEIGH
EXECUTIVE DIRECTOR

P.O. BOX 13087
CAPITOL STATION
AUSTIN, TEXAS 78711

AREA CODE 512
475-3571
1700 NORTH CONGRESS AVENUE

May 5, 1975

IN REPLY REFER TO:
TWDBP-O

General James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P.O. Box 12428, Capitol Station
Austin, Texas 78711

Dear Jim:

Please refer to your memorandum dated April 1, 1975 transmitting for review and comment the Draft Environmental Impact Statement for Elm Creek (Cen-Tex) Watershed, Texas."

Following our staff-level review of this report we are of the opinion that it complies with the basic intent of P.L. 91-190 Section 102(C). The opportunity to make this review prior to initiation of constructing a watershed work plan is appreciated.

As in any plan of development, we are interested in knowing what its effect will be on the water supply remaining in the watershed after implementation of the proposed work. We believe the report should place an estimated acre-foot value on the reduction in runoff resulting from land treatment measures. Also, the 45 proposed floodwater structures will put into permanent storage a certain amount of water that will no longer be available to other projects. The temporary floodwater storage will alter to an extent the flood-peak characteristics of the stream, which is important to designers of downstream reservoirs. If questions of this nature can be addressed we feel that the needs of this agency will be materially benefitted.

Sincerely,

Harry P. Burleigh

TEXAS WATER RIGHTS COMMISSION

STEPHEN F. AUSTIN STATE OFFICE BUILDING

April 24, 1975

Brigadier General James M. Rose
Director, Division of Planning Coordination
Office of the Governor
P. O. Box 12428, Capitol Station
Austin, Texas 78711

Attention: Mr. Wayne N. Brown

Re: U.S. Department of Agriculture,
Soil Conservation Service --
A. Review Draft Work Plan (February 1975), and
B. Review Draft Environmental Impact Statement (February 1975) for Watershed Protection and Flood Prevention, Elm Creek Watershed, Bell, Falls, McLennan, and Milam Counties, Texas.

Dear General Rose:

As requested in your letter of April 1, and the State Conservationist's letter of March 19, the Commission staff has reviewed the referenced documents relative to the $6,671,330 (price base: 1974), 10-year, Public Law 566 project involving the construction of 45 floodwater retarding structures (estimated cost: $4,953,481), and the installation of land treatment measures on 63,500 acres of crop, pasture, and range lands (estimated cost: $1,717,849).

The staff finds that:

1. The referenced documents reflect implicitly that reasonable consideration has been given to the Commission staff review comments submitted relative to the May 4, 1974, draft versions of the referenced project documents. (See letter of December 11, 1974, from the Governor's

Division of Planning Coordination to the State Conservationist, transmitting the Commission's letter of November 6, 1974.) The Addendum to the referenced Work Plan, summarizing the economic, social, and environmental assessment of the project pursuant to the Water Resources Council Principles and Standards for Planning Water and Related Land Resources (38 FR 24778, September 10, 1973), significantly enhances the project justification.

2. Clarification would be desirable as to the specific Federal statutory or regulatory authorization, basis, and purpose for the Addendum Part III, entitled "Abbreviated Environmental Quality Plan," involving diverse construction projects and actions totalling $21,327,800 (See page A-10, Work Plan). Furthermore, clarification would be desirable as to whether the $21,327,800 project is presented as the cumulative Public Law 566 project or as an extension of the basic Public Law 566 project. The Commission staff has been unable to locate readily the statutory or regulatory authorization for the aforementioned Addendum Part III, work in the Water Resources Council Principles and Standards (38 FR 24778, September 10, 1973), or in other guidelines pertaining to Public Law 566 projects. Also, if there is a relationship between Part III of the Addendum, and the Draft Environmental Impact Statement, this should be made clear.

3. The design, operation, and maintenance criteria of the structural measures reflect satisfactory consideration of water rights requirements (See page 27, 28, and 48, Work Plan).

4. The Draft Environmental Impact Statement appears to fulfill the administrative, coordination, and analytical requirements of Public Law 91-190, insofar as water rights and related impacts are concerned.

The above comments are furnished with the constructive intent of enhancing the referenced documents to ensure the development of a viable project, supported by justification which will ensure uninterrupted progress of work.

Sincerely yours,

TEXAS WATER RIGHTS COMMISSION

By: Alfred J. D'Arezzo, Ph.D., (C.E.)
Special Analyst for Environment
and Interagency Coordination

AJD:ll

EDMUND L. NICHOLS
Assistant Commissioner

April 9, 1975

Mr. Wayne N. Brown
State Planning and Development
Division of Planning Coordination
Office of the Governor
Austin, Texas 78711

Dear Wayne:

This is in response to your letter of April 1, 1975, requesting our comments on the Work Plan and Draft Environmental Impact Statement for Elm Creek (Cen-Tex) Watershed, Texas. We have reviewed these documents and are pleased that these communities are initiating action to retard the deterioration of agricultural lands.

We see no unacceptable environmental impacts resulting from this proposed project. We do question the desirability of converting 17,000 acres from cropland into rangeland. This trend may be necessary for the near future but may have to be reversed in the longer term when food demands increased production.

The Work Plan has a minor error on page 12, line 13. It should read "2800 man days annually" not "2800 days annually." There is an apparent inconsistency in the tables on pages 15 and 37. In both cases, reach 9 is shown as having a larger innundated area than the size of the reach.

The economic analyses and the cost-benefit ratio are calcualated on the bases of funds being available from several sources with the largest single amount coming from a 100 year loan with 5.875 interest rate. Even if such long term, low rate loans are available, the desirability of this length loan term is questioned.

We appreciate the opportunity to review this project.

Sincerely,

Edmund L. Nichols

eln/db

TEXAS STATE SOIL AND WATER CONSERVATION BOARD
1018 First National Building
Temple, Texas 76501
AREA CODE 817, 773-2250

April 28, 1975

Mr. Wayne N. Brown, Chief
State Planning & Development
Office of the Governor
Division of Planning Coordination
P. O. Box 12428, Capitol Station
Austin, Texas 78711

Dear Mr. Brown:

We have received review drafts of a work plan and environmental impact statement for the Elm Creek (Cen-Tex) Watershed Project from your office. These documents were prepared by the Soil Conservation Service, USDA.

We have been a part of this project since receiving the application for assistance on December 6, 1956. The board and staff of this agency have worked closely with the local sponsors in developing local financial capability and legislatively organizing the Elm Creek Watershed Authority. Prior to recommending planning assistance for the project, the members of the State Soil and Water Conservation Board inspected the project area and held a public hearing to solicit local views. We have also invested $121,750 of state appropriated funds in the work plan. In short, from our point of view, this project has been extensively coordinated and these documents present the most appropriate measures to meet the local people's objectives consistent with applicable federal laws, regulations and guidelines. We urge that these documents be channeled toward Congressional approval as expeditiously as possible, so that the people of Elm Creek Watershed who have sought this flood control project for twenty years can soon obtain assistance.

Thank you for the opportunity to contribute our views.

Sincerely yours,

Harvey Davis

Harvey Davis
Executive Director

HD/lc

THE UNIVERSITY OF TEXAS AT AUSTIN
BUREAU OF ECONOMIC GEOLOGY
AUSTIN, TEXAS 78712

rsity Station, Box X
512—471-1534

April 17, 1975

Mr. Wayne N. Brown, Chief
Division of Planning Coordination
P. O. Box 12428
Austin, Texas 78711

Dear Mr. Brown:

The staff of the Bureau of Economic Geology has reviewed the Work Plans and Draft Environmental Impact Statements for:

(1) Elm Creek (Cen-Tex) Watershed, Texas
(2) Pollard Creek Watershed, Palo Pinto County, Texas
(3) Sandy Creek Watershed, Jasper County, Texas

We foresee no significant adverse environmental effects associated with these projects.

Thank you for the opportunity to respond.

Sincerely,

W. L. Fisher
Director

WLF:wll

TEXAS WATER QUALITY BOARD

1700 NORTH CONGRESS AVE. 78701
P.O. BOX 13246 CAPITOL STATION 78711
AUSTIN, TEXAS

October 24, 1974

Re: Draft Environmental Statement and Elm Creek Wasteshed Work Plan

General James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P. O. Box 12428, Cap. Sta.
Austin, Texas 78711

Dear General Rose:

The staff of the Texas Water Quality Board has completed a review of the draft environmental statement and watershed work plan referenced above and have concluded that the projects would not pose lasting environmental problems. It has been noted that the environment will be protected from soil erosion and water and air pollution both during and after construction. Also, that agreements with local sponsors will set forth provisions for complying with state health regulations at reservoirs prior to any public recreational use.

The environmental statement would be greatly enhanced if it included a narrative description and pertinent information on the highly intensive soil conservation work that has been carried on within this watershed area. Since this early soil conservation work played a very prominent role in the soil and water conservation movement in this country it would be appropriate for it to be brought out and discussed in this report.

Also many Soil Conservationists and Agricultural Engineers in the State of Texas received their technical training and experience in this area.

We appreciate the opportunity to review this proposed project. If we can be of further assistance, please let us know.

Very truly yours,

Emory D. Long

Emory G. Long, Director
Administrative Operations Division

cc: Edward E. Thomas, Soil Conservation Service

TEXAS HIGHWAY DEPARTMENT
11TH AND BRAZOS
AUSTIN, TEXAS 78701

May 8, 1975

IN REPLY REFER TO
FILE NO.
D-5

SUBJECT: Work Plan and Draft Environmental Impact Statement for Elm Creek Watershed (Cen-Tex) in Bell, Falls, McLennan and Milam Counties

Mr. Wayne N. Brown, Chief
State Planning and Development
Division of Planning Coordination
Office of the Governor
P. O. Box 12428, Capitol Station
Austin, Texas 78711

Dear Sir:

We have reviewed the Work Plan and Draft Environmental Impact Statement for the Elm Creek watershed (Cen-Tex) which accompanied your memorandum of April 1, 1975, and although it appears that the highways and farm to market roads in the vicinity of the project will be largely unaffected by the proposed watershed improvements, we would appreciate the opportunity of reviewing the proposals of the Soil Conservation Service in greater detail in subsequent stages of plan development. Specifically cited are the features of the project noted in the first paragraph of our letter dated October 30, 1974. In addition to the structure sites listed previously, we would like to examine the detailed plans for Site Nos. 6 and 11.

Again we are grateful for the opportunity of reviewing the above docume and we look forward to a continuation of the cooperative spirit which h prevailed in our relations with the Soil Conservation Service.

Sincerely yours

B. L. DeBerry
State Highway Engineer

By: Marcus L. Yancey Jr.

Marcus L. Yancey, Jr.
Asst. State Highway Engineer

TEXAS HIGHWAY DEPARTMENT
11TH AND BRAZOS
AUSTIN, TEXAS 78701

October 30, 1974

IN REPLY REFER TO
FILE NO. D-5

UBJECT: Elm Creek (Cen-Tex) Watershed Work Plan
and Draft Environmental Impact Statement,
Bell, Falls, McLennan and Milam Counties

r. Wayne N. Brown, Chief
tate Planning and Development
ivision of Planning Coordination
ffice of the Governor
. O. Box 12428, Capitol Station
ustin, Texas 78711

ear Sir:

e have reviewed the Elm Creek (Cen-Tex) Watershed Work Plan and Draft nvironmental Impact Statement which accompanied your memorandum of ctober 15, 1974, and although it appears that the highways and farm o market roads in the vicinity of the project will be largely unaffected y the proposed watershed improvements, we would appreciate the oppor- unity of reviewing the proposals of the Soil Conservation Service in reater detail in subsequent stages of plan development. Specifically, e would like to examine the detailed plans for proposed floodwater etarding structures which will be located in close proximity to ex- sting highways and farm to market roads, especially those at Site os. 21, 23 and 34. Also, we would like to examine details of the pro- osed channel modifications at each highway and farm to market road rossing indicated on Figure 3 of the Work Plan.

ased on the limited engineering data presently available, it appears hat the overall plan will be beneficial to the Texas Highway Department, nd we look forward to working with representatives of the Soil onservation Service in the same spirit of cooperation which has existed n many previous projects.

Sincerely yours

B. L. DeBerry
State Highway Engineer

By: Wayne Henneberger

Wayne Henneberger
Bridge Engineer

BELL
CORYELL
HAMILTON
LAMPASAS
MILAM
MILLS
SAN SABA

CENTRAL TEXAS COUNCIL OF GOVERNMEN

Bell County Courthouse Annex East
Telephone 817-939-1801
BELTON, TEXAS

(Mailing Address: P. O. Box 729, Belton, Texas 76513)

April 18, 1975

Mr. Edward E. Thomas
State Conservationist
Soil Conservation Service
P. O. Box 648
Temple, Texas 76501

RE: Review of Work Plan for Elm Creek Watershed and Environmental Impact Statement

Dear Mr. Thomas:

The above mentioned project has been reviewed by the Project Notification and Review System of the Central Texas Council of Governments and given favorable comment by the Executive Committee on April 17, 1975.

The Central Texas Council of Governments comments as follows:

Consistent with the comments made by the Central Texas Council of Governments on October 14, 1974, (copy attached) concerning the Draft Work Plan and related Environmental Impact Statement of the Elm Creek Watershed, the Council continues to find the project consistent with the areawide and long range planning program of the Central Texas Region.

The Council wishes to express support for the project, and it is believed by the Council that the above mentioned project will be most beneficial to the area which it will serve.

The Council would be most appreciative of being kept informed of the progress of the project.

Sincerely,

Walton B. Reedy
Acting Executive Director

WBR:jo
cc: Mr. Edward Coufal, Elm Creek Watershed Authority
GEN. James Rose, Division of Planning Coordination

v. 3-16-73)

COMMENTS AND RECOMMENDATIONS

STATE OR AREAWIDE CLEARINGHOUSE

ject Title: Elm Creek Watershed Authority Work Plan and Environmental Impact Statement

Date April 18, 1975

ject Number: PR 75 27; SAI 5 03 12034

e of Clearinghouse: Central Texas Council of Governments

ress: P. O. Box 729, Belton, Texas 76513

COMPREHENSIVE PLANNING CERTIFICATION

The project described on the previous page DOES [x] DOES NOT [ ] conform with the comprehensive plan developed or in process of development for the area in which it is located.

Comments and Recommendations:

Central Texas Council of Governments
Walton B. Reedy
Acting Executive Director

W B Reedy

(Signature of Authorized Representative of Clearinghouse)

ENVIRONMENTAL ASSESSMENT

Date April 18, 1975

[x] We have reviewed this assessment and agree that no adverse environmental impact is probable.

[ ] Our comments upon the environmental impact are as follows:

Central Texas Council of Governments
Walton B. Reedy
Acting Executive Director

Walton B Reedy

(Signature of Authorized Representative of Clearinghouse)